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Archaeological Investigations at the West Rosebud Archaeological Site - 24ST651

Sally T. Greiser
Heidi Plochman

United States
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ARCHAEOLOGICAL INVESTIGATIONS AT
THE WEST ROSEBUD LAKE ARCHAEOLOGICAL SITE (24ST651)

Sally T. Greiser

Heidi Plochman

February 1981

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INTRODUCTION

The West Rosebud Lake Site is situated at the inlet at the southern end of West Rosebud Lake in the Custer National Forest, Montana (Fig. 1). The site was initially recorded by Dr. Leslie B. Davis, Museum of the Rockies, Montana State University, in 1972. Surface reconnaissance at that time produced numerous stone flakes and a single, corner-notched, chert projectile point.

Additional investigations at the site were required prior to the activation of a Montana Power Company dam which eventually resulted in the inundation of the site. In 1977, surface collections and test excavations were carried out by Mineral Research Center (MRC), Montana Tech Alumni Foundation, Butte, Montana. Based on the results of these preliminary investigations, Dr. Michael Gregg (1977:21) indicated that the site was of potential significance and eligible for inclusion in the National Register of Historic Places under 36 CFR 800.10 because it was likely to yield information important in prehistory.

During the summer of 1978 a crew from Mineral Research Center, under the direction of Dr. Gregg, excavated approximately 20% of the site. These excavations produced a number of dart and arrow points indicating sporadic use of the area for the last 6,000 years. Numerous bifaces, scrapers, a drill, and manufacturing debitage were recovered in addition to a limited quantity of fragmentary faunal remains.

An additional 15% of the site was excavated during the summer of 1979. This work was directed by Sally Greiser, as Principal Investigator, under sub-contract with Mineral Research Center. MRC provided equipment and crew members for the 1979 field season. A significant number of additional diagnostic artifacts were recovered in 1979. More importantly, controlled excavations revealed an intact paleosol present throughout the deposits. An additional soil remnant was in a restricted area of the site.

The data presentation and evaluation incorporates the results of both the 1978 and 1979 research. However, differences in field methods from one year to the next make it impossible to completely assimilate the results. Because this author was only involved in the 1979 research, there will be greater emphasis on data recovered during that time.

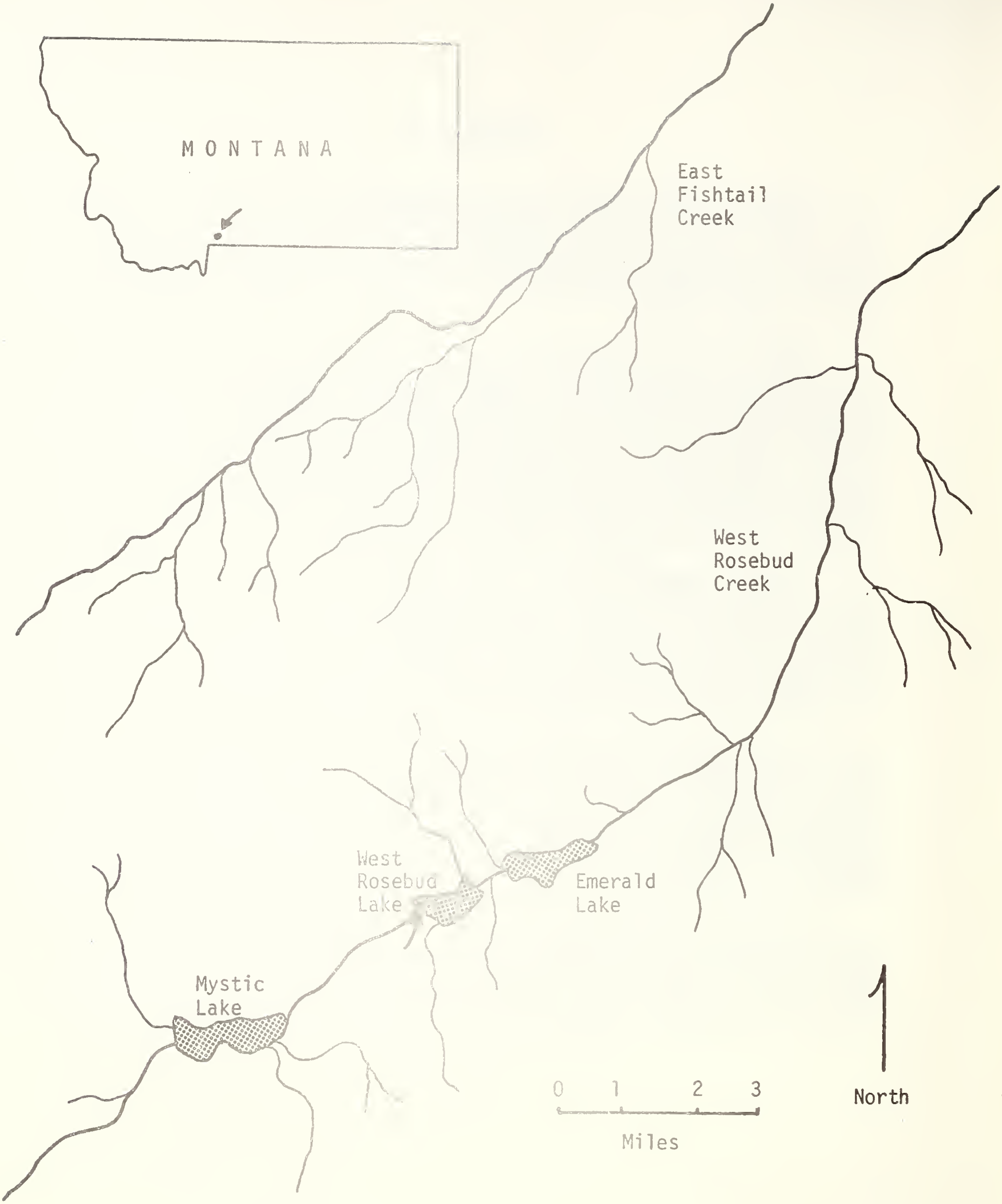


Figure 1. West Rosebud Lake Site (24ST651), Beartooth Mountains, Montana.

ENVIRONMENTAL SETTING

Topography

The rugged Beartooth Mountains of south central Montana reflect millions of years of uplift, folding and erosion, followed by renewed episodes of mountain building and erosion (Moore 1958). Following these cycles of mountain building and erosion, the landscape was further modified by two, and possibly three, glacial stages during the Pleistocene epoch (Hall 1959:1778).

The last major glacial stage, the Pinedale (ca. 29,000-12,000 years ago), is of most concern to us because of the effect of glacial ice sheets on human settlement patterns. In addition to the major Pinedale glacial stage, Richmond (1972) recognizes two, or possibly three minor glacial re-advances which occurred in high mountain valleys between 11,000-9,000 years ago. The upper reaches of the West Rosebud Creek Valley may have been inaccessible during these times. Montagne (1963) believes that ". . . probably the Pinedale was fairly restricted, and what piedmont lobes existed were gathered on the flats very close to the mountain source and that the ice did not cover the entire Yellowstone Plateau." Haines (1964, 1965), based on the distribution of Paleo-Indian projectile points which date to the late Pinedale, suggests that the high ridges in the area were not covered by Pinedale ice, but that the ice was restricted to the valleys.

During Holocene, or Recent, times three neoglacial advances have been recognized by Richmond (1972). These are dated at approximately 4000-2550 B. P., 1850-950 B. P., and 300 B. P.-present. Graf (1971) only notes two of these re-advances in his study of the Beartooths, these two occurring at approximately 2800 B. P. and 400 B. P. These neoglacial advances should be kept in mind during the following discussion of human occupancy of the West Rosebud Creek Valley.

Today, the Beartooth Range occupies an area approximately eight miles long and 35 miles wide. This range is bordered on the southeast by the Clark Fork of the Yellowstone and the Absoraka Mountains; on the east and northeast by the Bighorn Basin; on the north by a complex group of smaller uplifts; and on the northwest by the Bridger Mountains (Loendorf 1967:8). The Beartooth Mountains and surrounds are notable for their extreme topographic diversity. Fenneman (1931:157) describes the ruggedness of the Snowy Range of the Beartooths as follows:

> Their ruggedness comes in part from steep-sided peaks or ridges rising above the general level and over-steepened by the work of alpine glaciers, but chiefly from dissection by narrow and profound canyons.

The canyons broaden into undulating glacial valleys which lead onto the plains. Mountain peaks reach as high as 12,000 feet above sea level whereas valley floors are as low as 3500 feet.

Surface water is abundant in the area. In addition to the many streams which radiate down from the mountains, glacial lakes are common in the higher mountains. Drainage from the Beartooths is generally toward the north and northeast. Principal drainages include East and West Rosebud Creeks which flow into the Stillwater River, and Red Lodge and Rock Creeks which flow into the Clark Fork of the Yellowstone.

West Rosebud Creek flows through a glacial canyon on the northeast flank of the Beartooth Mountains. The West Rosebud Lake study area (6400 feet above sea level) is situated in the central portion of the drainage where the valley begins to broaden out and the slopes become less severe (Fig. 2). Access into the area from the Yellowstone Basin is characterized by an open valley with a gentle vertical rise. Beyond West Rosebud Lake the ascent rapidly becomes more challenging. The drainage ultimately provides access to the Beartooth Plateau from which a large number of drainages can be entered.

Figure 2. Photograph of the West Rosebud Creek Valley.

Climate

Because no major studies of Holocene climate have been undertaken for the area, only a tentative and conjectural reconstruction can be proffered at this time. The traditional Neothermal terminology of Anathermal followed by Altithermal and finally Medithermal provides a convenient general framework because of the lack of more precise data for the study area.

Although we have been warned against an uncritical use of this climatic scheme (Bryan & Gruhn 1964), accumulated evidence throughout the Rocky Mountain region attests to the general trends of a moist and cool Anathermal (7000-6000 B. P.), a warmer and/or drier Altithermal (6000-4000 B. P.), and a return to cooler and somewhat more moist conditions during the Medithermal (4000 B. P.-present) (Benedict 1973, 1978; Bryson *et al.* 1970; Mehringer *et al.* 1977; and Swanson 1972).

Annual precipitation as recorded at the Mystic Lake weather station, approximately two miles upstream from the study location, ranges from 15.44 inches to 32.40 inches with an average of 24.02 inches. Much of this precipitation occurs during the winter months when snowfall accumulations of greater than 100 inches are not unusual. Afternoon thunderstorms during the summer are also common.

Climatic characteristics are influenced by the prevailing winds from the Pacific Ocean. Summers are generally cool, rarely exceeding 70° F., and winters are extremely cold. However, Chinook winds (Ives 1950) provide temporary respite from the winter cold several times each winter.

Flora and Fauna

The area is within the subalpine fir - Douglas fir vegetation zone. Englemann spruce comprises a small proportion of this community. Lodgepole pine is fairly common in the study area due to its ability to move into this vegetation community with the loss of the climax overstory through fire, logging, or other disturbance (Ross & Hunter 1976). These conifers occupy the valley slopes along with various herbaceous species (Table I).

The Beartooth Mountains and adjacent lands provide a home for a wide variety of fauna (Table II). Some of these native species are no longer extant in the area. The topographic extremes and wide variety of habitats which occur along the length of West Rosebud Creek explain this variety.

In summary, the Beartooths are noted for topographic extremes and environmental variability. Accordingly, a wide variety of plant and animal resources have been available through Holocene times. These resources varied in response to changing climatic conditions. Although formidable in winter, the cool temperatures of summer have provided an escape from the heat of the Plains for humans and other animals throughout recent millenia.

TABLE I

Herbaceous Flora of the Subalpine Fir-Douglas Fir Climax Forest (Ross and Hunter 1976:35)

Pinegrass	Mallow ninebark
Grouse whortleberry	Oregon grape
Heartleaf arnica	Saskatoon serviceberry
Blue huckleberry	Richardson needlegrass
Common beargrass	Columbia needlegrass
Elk sedge	Spike trisetum
Dwarf huckleberry	Blue wildrye
Bearded wheatgrass	Idaho fescue

TABLE II

Native Fauna of the Beartooth Mountains

Large Herbivores:

Mule deer
White-tail deer
Elk
Moose
Bighorn sheep
Mountain goat
Antelope
Bison

Small Herbivores:

Raccoon
Porcupine
Beaver
Squirrel
Hare
Rabbit

Birds:

Blue grouse
Ruffed grouse
Mallards
Canada geese
Hawks
Eagles

Fish:

Cutthroat trout
Mountain grayling
Rocky Mtn. whitefish

Carnivores/Omnivores:

Grey wolf
Coyote
Mountain lion
Canadian lynx
Bobcat
Red fox
Badger
Wolverine
Weasel
Mink
Otter
Fisher
Marten
Skunk
Grizzly bear
Black bear

Physiography of the West Rosebud Lake Site

The West Rosebud Lake archaeological site occupies a bench-like terrace above West Rosebud Creek. The physiography of the site area indicates that in the past this location was part of a lakeshore. It appears that West Rosebud Lake originated as a glacial lake entrapped by a Pinedale (late Wisconsin) recessional or terminal moraine. Since that time the lake ceased to exist when the moraine which enclosed the lake was downcut by the drainage channel.

Cultural material eroding from the bank indicates that the secondary stream channel which meanders in the meadow above the lake is a fairly recent phenomenon. It is unknown how much of the original site area has been lost through stream action.

CULTURAL OVERVIEW

Culture History

Few professional archaeological studies have been done in the Beartooth Mountains. For some areas adjacent to the Beartooths there are a limited number of site reports and some cultural overviews, and these are used in the background information which is presented here. The majority of the archaeological information for high elevation occupations in south-central Montana and north-central Wyoming comes from surface remains, although there are some sites in the area which have been excavated and at least preliminarily reported (Table III) (Fig. 3). The results of these investigations will be briefly summarized in the following discussion of local prehistory. This discussion is within the chronological framework originated by Mulloy (1958) and recently revised by Frison (1978) for the Northwestern Plains culture area.

The Northwestern Plains have been occupied for at least 11,000 years by nomadic hunters and gatherers. Evidence of occupation before this time (pre-Clovis) is growing. The Clovis is the earliest recognized occupation during the Paleo-Indian Period. The Anzick Site near Wilsall, Montana, is a burial apparently dating from Clovis times (Lahren & Bonnichsen 1974). Unfortunately the site was uncovered during earth-moving activities, so it has been badly disturbed. Over one-hundred stone and bone artifacts were found with skeletal remains of two sub-adults covered in red ochre.

Following Clovis was a culture recognized archaeologically by the fluted Folsom point. Dates for these points are around 10,000 years before present (B. P.). Although Folsom points have not been found in a stratified site in the immediate area around the Beartooth Mountains, they have been found throughout Montana and Wyoming indicating a Folsom occupation of the area. The MacHaffie Site near Helena, Montana, has a Folsom component in the lowest level. The Hanson Site is a Folsom campsite and lithic tool manufacturing site located in the Bighorn Mountains (Frison 1978). Folsom points have also been observed from the Bighorns at Bridger, Montana, and in the museum at Pryor, Montana, (Loendorf 1967:133). One basal fragment of a Folsom point was found in the Clark Fork area (Loendorf 1967:95).

Agate Basin, Hell Gap, Alberta, Scottsbluff, Eden and Frederick are some of the point types which represent the post-Folsom Paleo-Indian occupations. These types have been found at several locations in and around the Beartooth Mountains, with dates ranging from 10,000 to 7,500 years ago.

TABLE III. ARCHAEOLOGICAL SITES DISCUSSED IN THE TEXT. (Numbers correspond to Figure 3.)

Site Number/Name	Site Type	Cultural Period	References
1. Anzick	Burial	Paleo-Indian	Lahren and Bonnichsen, 1974
2. Mummy Cave	Campsite/Workshop	Paleo-Indian through Late Prehistoric	Wedel, et al., 1968
3. Myers-Hindman	Campsite	Paleo-Indian through Late Prehistoric	Lahren, 1976
4. Red Lodge	Campsite	Paleo-Indian through Late Prehistoric	Mulloy, 1958
5. Hanson	Campsite/Workshop	Paleo-Indian	Frison, 1978
6. MacHaffie	Campsite	Paleo-Indian	Forbis & Sperry, 1952
7. 24CB405	Campsite	Paleo-Indian, Late Plains Archaic, Late Prehistoric	Loendorf, 1967
8. Pictograph Cave	Campsite/Pictograph	Middle Plains Archaic through Late Prehistoric	Mulloy, 1958
9. Dead Indian Creek	Campsite	Middle Plains Archaic	Smith, 1970
10. " " " II	Campsite	Late Plains Archaic	Frison, 1978
11. " " " III	Campsite	Late Prehistoric	Frison, 1978
12. Keogh Buffalo Jump	Killsite	Late Prehistoric	Conner, 1962
13. Hagen	Campsite	Late Prehistoric	Mulloy, 1942
14. Logan Mountain Lodge	Campsite	Late Prehistoric	Frison, 1978

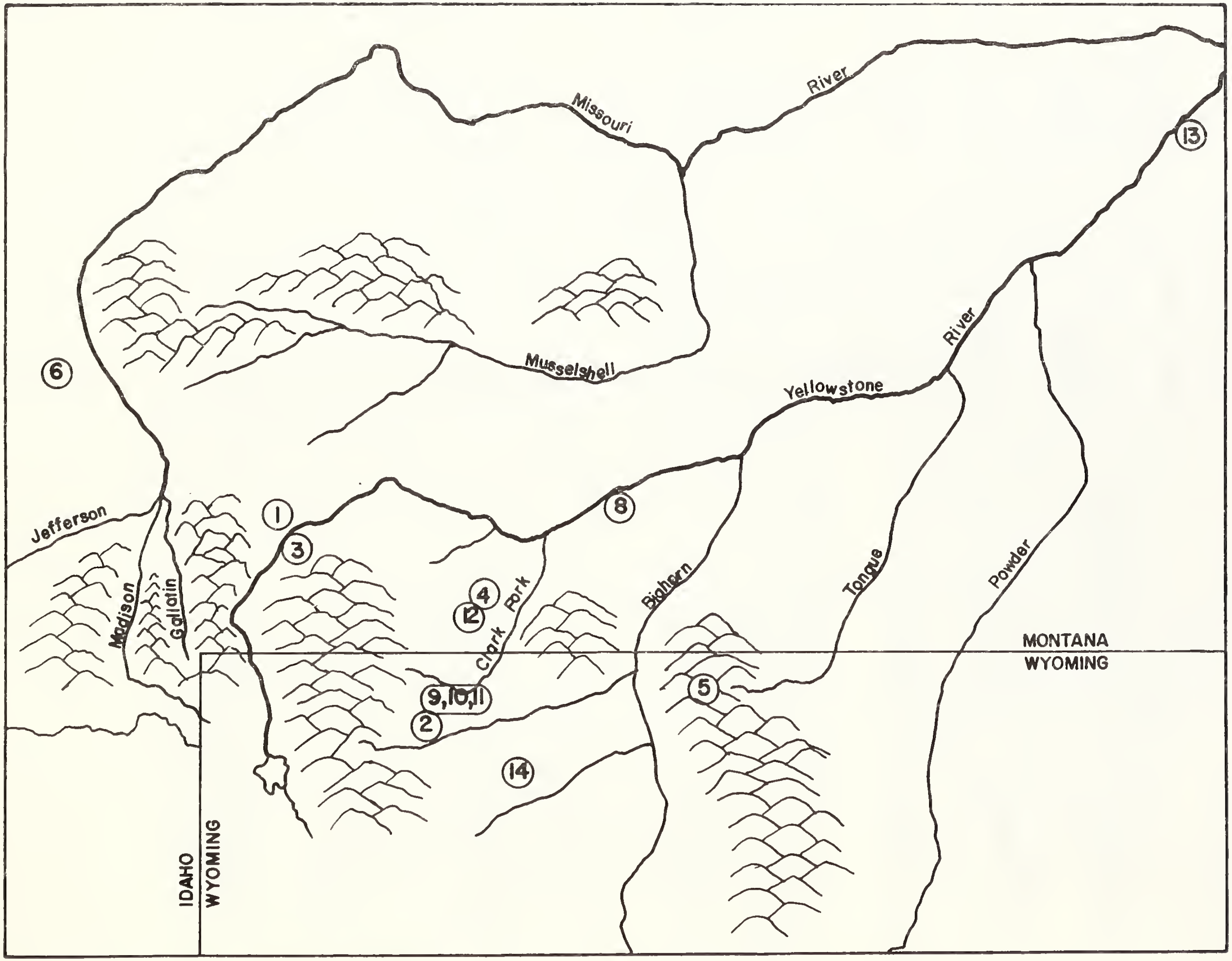


Figure 3. Archaeological sites mentioned in text.

The Mummy Cave Site (48PA201), located in the Absaroka Mountains, provides an excellent chronology ranging from the Paleo-Indian Period up to the late Prehistoric Period (9200 B. P.-A. D. 1590) (McCracken *et al.*, 1978; Wedel *et al.*, 1968). The shelter is very well protected from moisture (both rain and snow) and the dry conditions were ideal for the preservation of cultural material. Cultural remains uncovered in the Paleo-Indian levels included: firepits, knives, scrapers, lanceolate projectile points, incised bone, bone needles and awls, and a rock alignment about five and a half feet in length consisting of a continuous line of three stone slabs set on edge. The purpose of this alignment is not understood (Wedel *et al.*, 1968:80).

The Red Lodge Site (Mulloy 1943), located two miles east of Red Lodge, Montana, also provides evidence of Paleo-Indian occupation. "Agate Basin-like" and "Browns Valley-like" points were recovered at the site, along with more recent point types. Unfortunately, all artifact types occurred at all levels. Mulloy believes this mixing to be the result of natural causes (Mulloy 1943:179). Drills, scrapers, ovoid and triangular knives, tanning stones, a pestle, a mano and a metate were among the artifacts uncovered. The site is located in a small meadow, and there are many springs in the area.

The Paleo-Indians, at least in the earlier portions of the period were affected somewhat by a glacial environment, especially at higher altitudes. Haines (1963, 1965), working with data from Gallatin National Forest to the northeast of Yellowstone National Park, found that cultural material dating from what he terms the Early Prehistoric Period was consistently found at elevations above 9,000 feet. This, he believes, indicates occupation of certain high ridges whereas there is scant evidence of valley occupations during this time. From his investigations he suggests that the areas occupied are so sharply defined that there could have been a physical barrier, such as a glacier, preventing the use of the lower areas (Haines 1965:32).

The Early Plains Archaic which succeeded the Paleo-Indian Period, dates between about 7500 and 5000 years ago. Its beginning is marked by a change in projectile point type - from the lanceolate Paleo-Indian types to Early Plains Archaic side notched points. These large side-notched points have been found throughout the area, including the Mummy Cave Site (Wedel *et al.*, 1968) and the Myers-Hindman Site (Lahren 1976).

This period is also associated with the Altithermal climatic episode which is believed to represent drier conditions for the western United States. In discussing the effects of the Altithermal it should be remembered that drier, warmer conditions probably did not hit all areas at the same time and with equal severity, and that for specific areas it must be demonstrated that drier conditions existed (Bryan and Gruhn 1964). For the High Plains there does appear to have been a decrease in the open plains occupations and a concomitant increase in the use of sheltered locations at higher elevations (Greiser 1980; c.f. Frison 1978). These data, in addition to climatic indices, indicate that this was a time of greater warmth and aridity.

Because of the increase in mountain occupations during the Altithermal Period it is commonly believed that the higher elevations were places of refuge for the people of the High Plains. Taylor (1964:188) states that the Yellowstone Plateau "may have been a most attractive place for animals and men" during the Altithermal. The Plateau could have had less timber cover, making travel through the area easier than it is today (Hoffman 1961:90).

Significant amounts of cultural material were preserved at the Mummy Cave Site for the Early Plains Archaic Period. Artifacts uncovered included: large side-notched projectile points, knives, scrapers, bone awls and bone tubes which are believed to have been used as smoking pipes (Wedel *et al.*, 1968:72).

Following the Early Plains Archaic was the Middle Plains Archaic Period which dates from about 5,000 to 2,500 years B. P. Projectile point types indicative of this period are those in the McKean complex including McKean lanceolate forms with indented bases, stemmed Duncan points with sloping shoulders, and Hanna points with abrupt shoulders and slightly expanding stems (Mulloy 1954:50).

Although grinding slabs and manos are found in the archeological record prior to this time there is an apparent increase in the numbers and quality of grinding tools associated with campsites during the Middle Plains Archaic Period. It has been suggested that this increase reflects a greater emphasis on plant foods.

The Dead Indian Creek Site is a McKean winter campsite located in a small mountain basin in northern Wyoming. Winter occupation was determined by the aging of deer mandibles (Simpson 1974). All of the known McKean variants were present, along with grinding slabs and manos. Ceremonial treatment of mule deer skulls seemed to be in evidence at the site. A deer skull was found inside of a rock cairn, and others were placed around it. Radiocarbon dates obtained for the McKean levels at the site were 4400, 4200, and 3800 years B. P. (Frison 1978).

The Mummy Cave Site had a very thick cultural level (level 9) representing the McKean occupation of the shelter. Artifacts uncovered at this level included: shell beads, coiled basketry fragments, vegetable fiber cordage and netting, bone smoking pipes and sewing awls along with McKean complex projectile points. Also, this was the earliest level that milling stones, used for the preparation of plant foods, were discovered. The Carbon-14 date obtained for level 9 was about 4400 years B. P.

The Pictograph Cave Site near Billings, Montana, provides cultural material dating from the Middle Plains Archaic Period, and also from the Late Plains Archaic and Late Prehistoric Periods. There are over one-hundred drawn figures in the cave painted in black, red and white.

Mulloy, (1958:118-139) in studying some general distributions of known motifs in the cave, believed that most of the figures showed influences from the east (towards the Plains).

Stone circles generally associated with the Middle and Late Plains Archaic and most frequently, with the Late Prehistoric Period, commonly represent remains of tipis. Although none have been reported in the Beartooth Mountains, stone ring sites have been recorded in Yellowstone National Park (Taylor 1964) and in the Clark Fork Area (Loendorf 1967).

The Late Plains Archaic Period dates from about 3,000 to 1,500 years before present. The period is first characterized by corner-notched points collectively called Pelican Lake, and then later by large side-notched Besant points which are similar to Early Plains Archaic points.

Dates obtained for the Late Plains Archaic Period at the Mummy Cave Site range from about 2800 to 2000 years B. P. Artifacts in these levels included: corner-notched points, knives and a cobble hammer (Wedel *et al.*, 1968).

At the Myers-Hindman Site mixing of Middle and Late Plains Archaic types occurs in levels dated between about 3500 and 3200 years ago. In later levels, the Late Plains Archaic points are found without the McKean complex points. These levels are dated from about 2300 to 1470 years B. P. (Lahren 1976).

Projectile points became significantly smaller and lighter during the Late Prehistoric Period which begins about 1500 years ago (A. D. 500). Size is reduced for use with the bow and arrow which became widely accepted during this time. These points were side-notched with the basal configurations changing slightly through time and space. Points with both basal and side-notching appear near the end of the Late Prehistoric Period.

Several advantages are provided by the bow and arrow: the smaller projectile points and arrow shafts are easier to make and the unit is more portable than the dart toolkit. Also, the bow is more versatile and easier to control than the atlatl. For these reasons the adoption of the bow was widespread and rapid (Frison 1978).

Pottery also appears during the Late Prehistoric Period, although pottery is not a frequent find in archeological sites in the Northwestern Plains. The Intermountain Tradition is the only type which is recognized as being indigenous to the Northwestern Plains, although its origins are unknown. It is associated with the Shoshonean peoples who were in the area at this time. The technology of making this pottery type is not highly developed; it is usually thick and not well-fired. The vessels generally have a flat bottom and a "flowerpot shape" (narrowest at the bottom and widest at the top) although there are variations of this shape. Vessels with this shape were also carved out of steatite. It is not known which came first--the pottery or the steatite vessels. The earliest date for the pottery comes from the Myers-Hindman site where a date of A. D. 1160 was obtained for the Late Prehistoric occupation. Pottery types other than the Intermountain Tradition type were probably intrusive to the Northwestern Plains, that is, were introduced by late arrivals into the area.

Found at Mummy Cave were the mummified remains of an individual of apparent high status. The body was uncovered in level 3 and was dated at about A. D. 730. Projectile points made out of the finest agatized wood displaying exceptional workmanship were found in association with the mummy, and the body was covered with tanned mountain sheep hide. Stones had been placed around the individual forming a cairn.

Other artifacts dating from the Late Prehistoric Period at Mummy Cave included: corner and side-notched projectile points, grinding slabs, beads, pendants, coiled basketry, arrowshaft parts, fragments of netting, a skin boot, and grass liners for either boots or moccasins. A small bow (about 24 cm in length) was found and this is believed to be a toy (Wedel *et al.*, 1968:57).

Occasionally, wickiup structures are found in remote areas either standing or partially standing. The fact that they are found intact (or at least partially intact) indicates that they are associated with either the terminal Late Prehistoric or historic times. Wickiups and pole and brush structures are known to be present in the remote areas of the Gallatin and Absaroka Mountain ranges and a wickiup site was located in Yellowstone National Park (consisting of four structures) (Taylor 1964:83).

The Late Prehistoric Period ended with the introduction of the horse which brought about significant changes to the cultures of the Plains. Exactly when the horse was introduced into the area is not well-documented in archaeological sites, but other sources indicate that the Shoshoni were obtaining horses by about 1725 and the Crow were receiving them shortly after this time (Ewers 1955:3-19; Haines 1938:430; Secoy 1953:33-38).

European trade goods also appeared at this time. These items were usually decorative in nature and appear in archaeological sites commonly in association with burials (Frison 1978:74). Beaver, mink and raccoon were more extensively trapped by the Indians for pelts as the European demand for them as trade goods increased.

The combination of the horse and the gun enabled the Plains tribes to gain larger territories of land. As foot nomads it would have been nearly impossible to defend comparably large areas. Tribes who had both guns and horses and were expanding into new areas had a clear advantage over tribes which had not yet obtained guns. Movements of tribes can be generally reconstructed for the later portions of the Late Prehistoric and during the Protohistoric Period.

Based on linguistic studies it is believed that the proto-Crow-Hidatsa group was originally located in the Minnesota-Iowa area. From there they migrated into North and South Dakota where they met the Mandan and Arikara on the Missouri River (Malouf 1967:6). Here they lived in earth lodges, made pottery and practiced maize horticulture. The Hidatsa-Crow group eventually split, with the Hidatsa staying in the North Dakota area and the Crow moving westward towards the Yellowstone River (Malouf 1967:6). By the late sixteenth or early seventeenth century the group had entered the area of the Yellowstone River Drainage where they soon came into contact with the expanding Shoshoni-Commanche group (Hewes 1948:51). When first arriving in this area the Crow continued to practice horticulture, but they soon shifted towards a hunting and gathering existence. Evidence of this comes from the Hagen site which apparently represents "transitional hunting-horticultural peoples" (Mulloy 1942). Pottery at the site is believed to be associated with the Crow. Sometime after their arrival on the Yellowstone and before contact with Whites the Crow split into the River Crow and the Mountain Crow (Malouf 1967:7).

As of 1400 the proto-Shoshoni-Commanche group was probably in eastern Nevada and western Utah (Hewes 1948:54; Malouf 1967:13). From here they began to migrate northward, bringing with them cultural traits from the Great Basin. Intermountain pottery and a reliance on plant and small animal gathering were among these traits. Their migration probably did not involve large groups of people; instead it was a migration of small groups who gradually moved northward in search of more productive areas for plant collecting (Malouf 1967:13). From Nevada and Utah they moved into southern Idaho where the group split. Some people moved northward up through the Snake River System into southwestern Montana, while others moved eastward into the Wind River, Wyoming area. The date of this movement is estimated to be about A. D. 1500 (Hewes 1948:54). Those who had migrated into southwestern Montana continued up the North Fork of the Snake River, through Targhee Pass and Raynolds Pass and into the Madison and Jefferson River systems (Hewes 1948:54). About A. D. 1700 horses were obtained by the Shoshoni-Commanche group through the Inter-Montana trail from the New Mexico Spanish Colony (Hewes 1948:54). Once they had horses the Shoshoni-Commanche split occurred. The Commanche moved east and south onto the Plains while the Shoshoni moved northward toward Canada (Malouf 1968:9). Until about A. D. 1750 the Shoshoni controlled an area which included southeastern Montana, Yellowstone National Park, the Bighorn Mountains and the country around the present-day towns of Livingston, Lewistown, Denton and Billings (Tiet 1930:304-5). After A. D. 1750, the Shoshoni were driven west of the Rocky Mountains by the Blackfoot and the Crow.

The Kiowa, it is believed, originally inhabited the mountains. Mooney was told in 1892 by an Arapaho informant that when they first knew of the Kiowa they were living in the area near the towns of Gallatin and Virginia City in Montana (Mooney 1898:153-155, taken from Taylor 1964:41). They migrated out of the mountains and onto the Plains probably around A. D. 1700. By 1735 they were located near central Wyoming (Hewes 1948:55; Malouf 1967:15). The Kiowas were friendly with the Crow, perhaps as early as 1765 (Hewes 1948:55).

During the seventeenth century the Blackfoot were living in the Eagle Hills of Saskatchewan. Eastern neighbors of the Blackfoot pushed them south and to the west where they met the Shoshoni, Kutenai and Flatheads. However, by 1800 the Blackfoot had taken from the Shoshoni the entire area north of the Yellowstone and east of the Rocky Mountains. There were several reasons why the Blackfoot were able to do this. By 1730 the Blackfoot were receiving guns from the Cree, making them the first group in the area to have the combination of the gun and the horse. The Shoshoni were also fighting the Crow who were gaining territory on the Yellowstone River. Finally, the Shoshoni were hit by an epidemic of smallpox which greatly reduced their numbers. This decimation of the Shoshoni population helped both the Crow and the Blackfoot (Stearn and Stearn 1945:132). Historically, the Crow were located in the Clark Fork area, and the Blackfoot were located to the north and west of the Crow.

After the disappearance of the bison herds west of the Rockies around 1850, some Shoshoni groups traveled east across the Yellowstone Plateau to hunt buffalo in Montana and Wyoming (Taylor 1964:36). However, the Blackfoot were a very war-like tribe, and those who traveled across their territory had to travel in large numbers to prevent attack (Taylor 1964:40).

The Atsina is a group which is related to the Arapaho, and in a lesser way to the Cheyenne. The Atsina-Arapaho group originally was located in Minnesota. Later they moved into North and South Dakota, and here the group divided---the Arapaho moved south while the Atsina moved west into Montana. The Atsina were allied with both the Blackfoot and the Crow. Hyde (1959:178-9) suspects that the Atsina had access to guns through trade with the British and that the Atsina helped the River Crow drive the Shoshonis from the Yellowstone and Bighorn country around 1750.

It appears that the West Rosebud Lake area was isolated from many of the events in early Montana history. During the fur trade and exploration eras in Montana (1800-1865), most activity was confined to major drainages, such as the Yellowstone. While it is conceivable that fur traders and Indian fur hunters trapped the West Rosebud drainage, there is no written record of such activity. Furthermore, it is generally accepted that much of the Yellowstone River Basin was "off limits" to early Anglo fur trappers. Hostility from the Blackfeet, and sometimes the Crow, prevented penetration of the region well into the 1850s.

With regards to early mining history along the creek there is no written documentation of gold or silver mining in the immediate area. There was one major expedition into the region during the 1860s. In 1863, James Stuart, Samuel T. Hauser, and a number of other gold seekers left Bannack for a journey along the Yellowstone Basin. Their activity was concentrated along the Yellowstone and there is no evidence that they ventured into the Beartooth Mountains. Annin (1964) claims that there was little gold placer mining in the region during the 1860s and 1870s, and this assertion is supported by contemporary accounts (Rossiter 1874). Annin (1964:73) states that not until the 1880s did mining truly begin in the region.

From 1868 until 1882 this area was incorporated within the Crow Reservation. This land status definitely inhibited the use of the area by non-Indians. In the 1880s large-scale copper mining briefly flourished at Nye, several miles north of West Rosebud Lake. The mining and smelting was initiated by Jack Nye and two other investors who established the Stillwater Mining Company. The fact that the town was located within the Crow Indian Reservation forced the federal government to close the smelter at Nye. This action bankrupted the Stillwater Company and quickly ended development at Nye (Annin 1964:75).

Chrome mining began in the Nye area during the early 1900s. However, not until World War II did it become a significant industry.

The construction of the Mystic Lake power facility and transmission line occurred between 1917-1925. Although most of this activity was based a mile upstream from West Rosebud Lake, the transmission line ran within 50 meters of the site.

The access road to the Mystic Lake Hydroelectric facility also had an impact on West Rosebud Lake in that the area became popular for recreational camping. As a National Forest campground the West Rosebud Lake Site attracted many campers. Situated upstream from West Rosebud Lake, West Rosebud Falls ceased to exist when the dam was constructed. Undoubtedly the falls had attracted visitors to the area for many years, and probably centuries.

Subsistence and Settlement Patterns

In order to understand how the West Rosebud Lake Site fits into the scheme of prehistoric subsistence and settlement patterns in the Beartooth Mountains an attempt is made to reconstruct the resources which might have attracted human groups to the area. Environmental data indicate that climatic changes have been minimal during the last several thousand years. Accordingly, it is reasonably safe to assume that the resources which attracted people to the area 100 years ago were basically the same resources which attracted prehistoric people.

The archaeological record provides evidence that during Clovis times in the Northwestern Plains, bison and mammoth were important sources of food and other supplies. After the extinction of the mammoth (around 11,500 years B. P.) bison became a staple of the diet in many areas of the Plains and remained so until Protohistoric times.

Archaeological evidence from large numbers of prehistoric sites indicates that communal efforts were used in bison procurement, involving either driving them off a cliff or into a natural trap or man-made corral. Communal drives were not the only form of bison procurement, however, individual or small group kills do not survive as well in the archeological record. Little is known about bison procurement in the Beartooths. The lower valleys would seem to offer ideal summer habitat for bison. A bison jump site has been located near Nye, Montana, (the Keogh Buffalo Jump Site) but this has not been professionally investigated.

During the Protohistoric Period communal drives of bison were abandoned. The horse made the individual hunter more efficient; he could now ride alongside of the bison and dispatch it quickly. This method was more expeditious than communal drives and certainly less wasteful.

Various other animals were exploited in the Northwestern Plains area including mountain sheep, antelope, deer and elk. Mountain sheep inhabit areas of high altitude and are able to negotiate extremely rugged terrain. Methods of prehistoric hunting of mountain sheep are not entirely clear; but one possibility is that of a drive complex similar to that used on bison. However, sites which are suspected of being mountain sheep drive sites do not have topographic features steep enough to prevent the mountain sheep from simply walking down the drop-off when driven to it. Some type of holding bin must have existed, although they have not been preserved (Frison 1978:258).

At the Mummy Cave Site mountain sheep was by far the most abundant of faunal remains at all cultural levels (Wedel *et al.*, 1968:26). For the Protohistoric Period, there is undisputed evidence of mountain sheep traps which are believed to be of Shoshonean origin (Frison 1978:265).

Antelope live primarily in open country and with proper access they will range into the higher elevations. They are very curious animals and this can be used to the hunters advantage by enticing the animal closer to him. Evidence of communal killing of antelope has not been found in the archaeological record until almost historic times when entrapment of antelope was practiced (Frison 1978:252).

Elk inhabit rough country, thick timber and brushy areas. They spend summers in the mountains and winters in the valleys. Archeological evidence indicates that elk were killed individually, presumably by stalking them through the woods much as hunters do today.

Mule deer, like elk, move to higher elevations during the summer months, and they are adept at getting around in rugged terrain. They are not considered to be difficult to hunt; when they are surprised they will run for a short distance but then stop to look back. Snares and pitfalls were used historically to trap mule deer, although there is no evidence of this being done prehistorically. In behavior, mule deer and mountain sheep are similar and Frison (1978:768) believes that they could have been taken in the same trap, although conclusive evidence is still missing. Mule deer made up the majority of the bone remains at the Dead Indian Creek site, a McKean winter campsite (Frison 1978:54).

Whitetail deer also appear prehistorically in the archeological record, but they are more difficult to kill than mule deer using stalking techniques and remains do not appear in the Northwestern Plains as frequently as those of mule deer (Frison 1978:273).

Carnivores available for exploitation included coyotes and wolves (hunted mostly for hides), fox, and black bear (for meat, tallow, hides and claws). The grizzly bear once roamed the Plains, but it was feared and considered to have supernatural powers.

Small mammals were an important part of the subsistence activities in the Northwestern Plains. They provided a relatively secure resource base because they were found in restricted localities, they reproduced rapidly, and, in some cases, they stored seeds which could be robbed (Denig 1965). On the negative side, many were not available during the winter because they were in hibernation and relatively little meat is provided by each animal. Remains of small mammals including squirrel, porcupine, rabbit and beaver are commonly found in prehistoric campsites. Besides meat, small mammals provided an important source of furs. Beaver, ermine and mink were especially sought after for their hides.

Fish and waterfowl also supplemented the diet, to varying degrees. Although more recent Plains groups thought fish to be unclean (Ewers 1958), the Shoshoni are known to have consumed fish (Murphy 1955). Fish bones and scales were found in the upper levels of the Mummy Cave Site (Wedel *et al.*, 1968).

Historically, eagle feathers were highly valued by all of the Plains tribes, and the catching of an eagle was considered a dangerous task to be taken on only by men claiming to have supernatural powers. The following quote describes eagle-catching as preformed by the Blackfoot (Ewers 1958:85):

> On the top of the hill a warrior dug a pit about four feet deep, large enough for him to hide in. He roofed the pit with poles, twigs and grass. After he placed a large piece of meat or a dead rabbit or other small mammal on the roof for bait he entered the pit and rearranged the cover to conceal himself from view. There he waited until an eagle swooped down to take the meat. Then he quickly reached through a crevice in the roof, grasped the eagle by both feet, pulled it into the pit and wrung its neck.

In summary, the faunal exploitation strategy was one of diversity. It is not uncommon to recover the remains of more than twenty species in a prehistoric campsite whether it be Paleo-Indian, Archaic, or Late Prehistoric. These people had knowledge of and took advantage of most, if not all, the species available to them.

Knowledge of edible plants was a must for supplementing the diet in the Plains region. Grinding slabs and manos are found throughout most of the archaeological record and indicate processing of plant foods. Hard shells of seeds must be cracked and then the seed must be reduced to grits or flour in order for the body to digest them. There are many plant foods, however, that do not require the use of special tools or features that would be preserved for archaeologists to examine. Fruits, berries and tubers may leave no evidence of use. Edible plants which would have been available to people in the Beartooth area are presented in Table IV.

A substantial reliance on plant resources for food as well as medicine is indicated from ethnographic information for the Northwestern Plains. Dried plant foods often sustained people through the long winters.

Plants mature progressively later as the elevation rises and animals such as deer and elk spend summers at higher elevations making use of the plants as they mature. Ethnographic accounts of the Shoshonean peoples indicate that they followed the maturing plants (and the animals which fed on the plants) up to higher elevations during the summer months. While the women gathered plant foods in the high mountains the men hunted and fished nearby (Murphy 1955:309).

Toward the end of the summer there was a movement down towards the foothills to prepare for the winter. Dried berries and meat along with fat and marrow were combined to make pemmican. Pemmican and other foods which had been dried for storage were stored in caches or pits in the ground for winter.

Both the Eastern Shoshoni and the Bannock of Idaho spent winters in the protected valleys of the foothills rather than in the open plains. Warmer temperatures, less wind and less severe temperature changes were advantages provided by the foothills over the open plains during the winter months (Murphy 1955:307, 319; Shimkin 1947:275). Also, elk, deer, antelope and rabbit (important foods to the Shoshoni) traveled down to the lower elevations. These winter camps were the stable centers of the settlement pattern (Murphy 1955:307, 332).

Once the late spring arrived the Shoshoni moved out onto the plains to hunt the buffalo which gathered there in large herds after the winter. As summer gradually progressed the Shoshoni again traveled to the mountains.

Arthur (1966) believes that a model of seasonal transhumance is applicable to the prehistoric occupation of the Upper Yellowstone Valley. Good (1974:141) feels that Arthur implies in his theory that only small

TABLE IV. EDIBLE PLANTS in the Beartooth Area.

Common Name	Scientific Name	Edible Part(s)	Habitat
American Bisort	Polygonum bistortoides	roots, (raw, roasted boiled)	Moist meadows & swamps, usually above 8000 ft.
American Vetch	Vicia americana	seeds, stems (raw)	Open ground.
Arrowhead	Sagittaria cuneata	roots (boiled, roasted)	Shallow water (streams and lakes), lower elevations of Rocky Mt. area.
Arrowleaf Balsamroot	Balsamorhiza sagittata	seeds, roots, stems (raw or cooked)	Dry, often stony ground.
Bitterroot	Lewisia rediviva	root (boiled, baked, powdered into meal)	Stony hills, ridges and slopes.
Buffalo Berry	Shepherdia argentea	berries (raw)	Riverbanks, valleys, plains, low meadows.
Bulrush	Scirpus acutus	raw stems, roots (baked, dried or ground into flour)	Wet ground or shallow water, lower elevations of Rocky Mt. area.
Bunchberry	Cornus canadensis	berries (raw or cooked)	Moist wooded areas.
Burdock	Arctium minus	leaves, stems, roots (after boiling)	Below 8,000 ft.
Camas	Camassia quamash	bulb (baked, roasted, dried, boiled, raw)	Moist, open meadows.
Chokecherry	Prunus melanocarpa	berry (raw; used in pemmican)	Hills, valleys, riverbanks.
Cow Parsnip	Heracleum lanatum	stems & roots (raw or cooked)	Moist ground, partial shade, from plains to near timberline in Rocky Mt. area.
Common Cattail	Typha latifolia	stems, roots (roots raw, cooked or pounded into meal)	Moist areas or shallow water, usually below 8,000 ft.
Curlydock	Rumex crispus	leaves, stems (raw or boiled)	Open areas.
Golden Currant Sticky Currant Squaw Currant Western Black Currant	Ribes aureum Ribes viscosissimum Ribes cereum Ribes petiolare	berry (raw or dried and mixed with rendered fat for pemmican)	Plains, hills, valleys
Dogtooth Violet	Erythronium grandiflorum	leaves, (raw or boiled) bulb (boiled, dried and pounded into meal)	Up to timberline.
Elderberry	Sambucus pubens	berry (raw)	Along streams, moist mountain slopes.
Elk Thistle	Cirsium foliosum	roots, stems (can be eaten raw)	Moist areas, from low valleys into mountains.
Engelmann Aster	Aster engelmannii	leaves (boiled)	
Fairybells	Disporum trachycarpum	berries (can be eaten raw)	Rich damp soils of woods and brush.
Flowered Lettuce	Lactuca pulchella	leaves, stems (raw) roots (gum formed when chewed)	Moist areas.
Green Gentian	Frasera speciosa	root (raw, roasted, boiled)	Moist to medium dry open areas, usually above 5,000 ft.

Common Name	Scientific Name	Edible Part(s)	Habitat
Gromwell	Lithopspermum incisum	roots (cooked)	Dry soil of plains, foothills and mountains.
Groundcherry	Physalis subglabrata	berries (raw or cooked)	Open ground, prairies, plains.
Gumweed	Grindelia squarrosa	leaves (raw or steeped for tea)	Dry, open places; disturbed areas.
Hawkweed	Hieracium albertinum	green plant and juice (coagulated for gum)	Hills and mountains, often in wooded areas.
Horsemint	Monarda menthaefolia	leaves (for tea and for flavoring)	Moist to medium dry soil, mostly in pine forests.
Huckleberry	Vaccinium ovalifolium	berries (can be eaten raw)	Moister areas of mountains.
Indian Turnip	Psoralea lunceolata	root (raw, boiled, dried and pounded for thickening agent)	On hills and mesas.
Kinnikinnick	Arctostaphylos uva-ursi	berries (boiled) leaves (dried and smoked by Indians)	Dry (but not desert) areas, usually sandy soil.
Leopard Lily	Fritillaria atroporpurea	corms (boiled)	Dry, open woods, slopes, fields, and meadows.
Meadow salsify	Tragopogon pratensis	juice (coagulated and chewed) roots (raw or cooked)	Open ground.
Mint	Mentha arvensis	leaves (for flavoring or steeped for tea)	Common in moist areas.
Mountain Ash	Sorbus scopulina	berries (raw)	Moist soils, mountainous areas.
Mountain Sorrel	Oxyria digyna	leaves (raw or cooked)	Rocky, wet areas, usually above timber-line in Rocky Mt. area.
Nodding Onion	Allium cernuum	tuber (raw or cooked)	Moist areas of valleys, hillsides mountains.
Oregon Grape	Mahonia repens	berries	Woods and thickets of mountains.
Pine	Pinus sp.	seeds (raw or roasted	Slopes, canyons, above sagebrush.
Pink Milkweed	Asclepias speciosa	young shoots, pods, leaves, flowers (cooked) juice (for gum)	Common at low to medium elevations.
Red-Osier Dogwood	Cornus sericea	fruit (can be eaten raw) bark (used by Indians for smoking)	Meadows, boggy areas and stream-banks, up to 7,000 ft.
Red Raspberry	Rubus idaeus	berries (can be eaten raw)	Mountainous country; mostly at higher elevations.
Red Twinberry	Lonicera utahensis	berries (raw)	Moist thickets; often along streams in open coniferous-forest.
River Hawthorn	Crataegus rivularsis	fruit (raw)	Along streams and in woods and thickets.

Common Name	Scientific Name	Edible Part(s)	Habitat
Rose Berries	Rosa woodsii	berries (raw or boiled)	In-thickets, woods, streamsides, mountainslopes and prairie regions.
Sego Lily	Calochortus nuttallii	bulb (boiled or ground for meal)	Open woods, slopes, plains and meadows or in partial shade; up nearly to timber-line.
Serviceberry	Amelanchier alnifolia	berries (can be eaten raw)	Stream banks, moist hillsides, in woods or open slopes.
Snowberry	Symphorecarpos racemosus	berries (raw or cooked)	In woods and thickets.
Springbeauty	Claytonia lanceolata	roots, stems (raw or boiled)	From low elevations to almost timber-line, on rich soil; sometimes in partial shade.
Strawberry	Frafaria vesca	berries (raw), leaves (steeped for tea)	Moist ground, often sandy in open woods, fields and hillsides.
Sunflower	Helianthus annuus	seeds (raw or roasted)	Dry, open ground.
Thimbleberry	Rubus parviflorus	berries (raw)	Mostly at higher altitudes in mountainous country.
Twisted Stalk	Streptopus amplexifolius	berries (raw)	Moist wooded areas.
Watercress	Rorippa nasturtium-aquaticum	leaves, stems (raw)	In springs and slow streams.
Waterleaf	Hydrophyllum capitatum	young shoots (cooked or raw)	Moist rich soils, often in shaded area.
White Bog Orchid	Habenaria capitatum	tubers (raw or boiled)	Mostly in moist to wet boggy areas.
Wild Hyacinth	Brodiaea douglasii	bulb (raw or boiled)	Dry, open ground.
Wild Plum	Prunus americana	fruit (raw)	Along streams in valleys, usually at lower elevations.
Wyeth Biscuitroot	Lomatium ambiguum	root (raw or ground into meal)	Dry ground.
Yampa	Perideridia gairdneri	tubers	Damp ground.
Yellow Evening Primrose	Oenothera rydbergii	seeds roots	Moist ground.
Yellow Fritillary	Fritillaria pudica	bulb (raw or cooked)	Dry, open woods, slopes, fields and meadows.
Yellow Monkeyflower	Mimulus guttatus	leaves (raw)	Moist, wet ground.
Yellow Pondlily	Nuphar polysepalum	seeds, roots (boiled or roasted)	In lakes, ponds and slow moving streams.

groups traveled to higher elevations to gather plants and then they returned to a base camp which was located at lower elevations. Good believes that the evidence which comes from the Pryor Mountains indicates that extended family bands moved to higher elevations during the summer, and what Arthur terms as "base camps" are actually winter settlements. This would conform to the Shoshoni settlement pattern as described above.

From the surveys which have been done in areas adjacent to the Beartooths, it appears that water is a major factor in site location. In the survey done in Yellowstone National Park (Taylor 1964:53) artifacts were especially concentrated at or near the confluence of creeks or streams and also at places where streams left or entered lakes. From cursory examination this same pattern appears to hold true for the Beartooths (Wetsteon 1980). Loendorf (1967:91) notes that cultural remains were present at nearly every freshwater spring in the Clark Fork area. Also, Good (1974:141) found that large sites in higher elevations were situated around the few water sources located there.

In summary, the Northwestern Plains have been occupied for at least 11,000 years primarily by nomadic hunters and gatherers who moved with the availability of food resource. Human groups in this area had cultural systems which changed little throughout prehistoric times. With the introduction of the horse and the gun during the Protohistoric period the societies in the Plains area were altered significantly.

Sites were occupied for short periods of time: as available food in an area decreased people moved in search of more productive areas. Climate, weather and insect infestations were some variables which affected resources. Big game, smaller animals and plants were all exploited; the proportions in the diet varied with the season and with specific conditions. Wide economic activities were a necessity, as narrow specialization in the Northwestern Plains would have been disasterous (Frison 1978).

The Beartooth area cannot be described in terms of a singular cultural influence - both the Great Basin and the Northern Plains influenced the area during Late Prehistoric times. It is unknown how many population movements in and out of the area occurred prior to that time. For the Beartooth Mountains, further work is necessary if we are to understand more fully the lifestyles of the prehistoric peoples who lived there.

PROJECT METHODS AND TECHNIQUES

A full-time crew of ten individuals in addition to a cook spent 15 work-days at the West Rosebud Lake Site during July, 1979. The Principal Investigator directly supervised the excavations for the duration of the project. Consultants who spent one or more days at the site include Dr. Ruthann Knudson, University of Idaho Department of Anthropology, and Dr. William Schafer, Montana State University soils scientist. Dr. James Keyser, then with the Custer National Forest, spent two days at the site.

The main objectives of the 1979 season were to further refine horizontal and vertical distributional information, clarify site integrity, and to recover, describe, analyze, and report sufficient information to adequately mitigate adverse effects on the National Register eligible property. These objectives were met through careful excavation and analysis of archaeological data augmented by detailed soils information.

Excavation Layout, Techniques and Recording - 1979

Preparatory fieldwork included establishing a permanent datum point which corresponded to the temporary datum point used the previous year. The datum is marked by a brass pin set in concrete. From this point we staked a two-meter grid system over the most intensively used area of the site which still remained intact. A transit was used to record the surface elevation for each grid. These readings were taken from each northeast corner stake. The elevation at the datum point is approximately 1,950 meters (6,398 feet). Accordingly, all depth information is presented in reference to this datum elevation (*e.g.*, 15-20 cm below datum).

In an effort to locate productive areas of past cultural activity a random sampling scheme was devised. One-meter test units were excavated in sample grids until an intact occupation level was located. Several of our initial test units proved unproductive but by the third day we had located an area of intact deposits (Fig. 4). We concentrated our efforts on this area throughout the duration of the project. A few quadrants of grids within this area were not excavated due to the presence of large tree stumps. Attempts to work around large roots proved to be too time consuming. Furthermore, subsurface disturbance caused by root growth was probably substantial.

Excavation was carried out with trowels in an attempt to maximize *in situ* data recovery. Shovels were used only to remove overburden and for excavation during the last day of fieldwork. Prior to initiating controlled excavation, the surface was cleared and leveled and all modern campfire debris was entirely removed in order to avoid mixing disturbed with intact deposits.

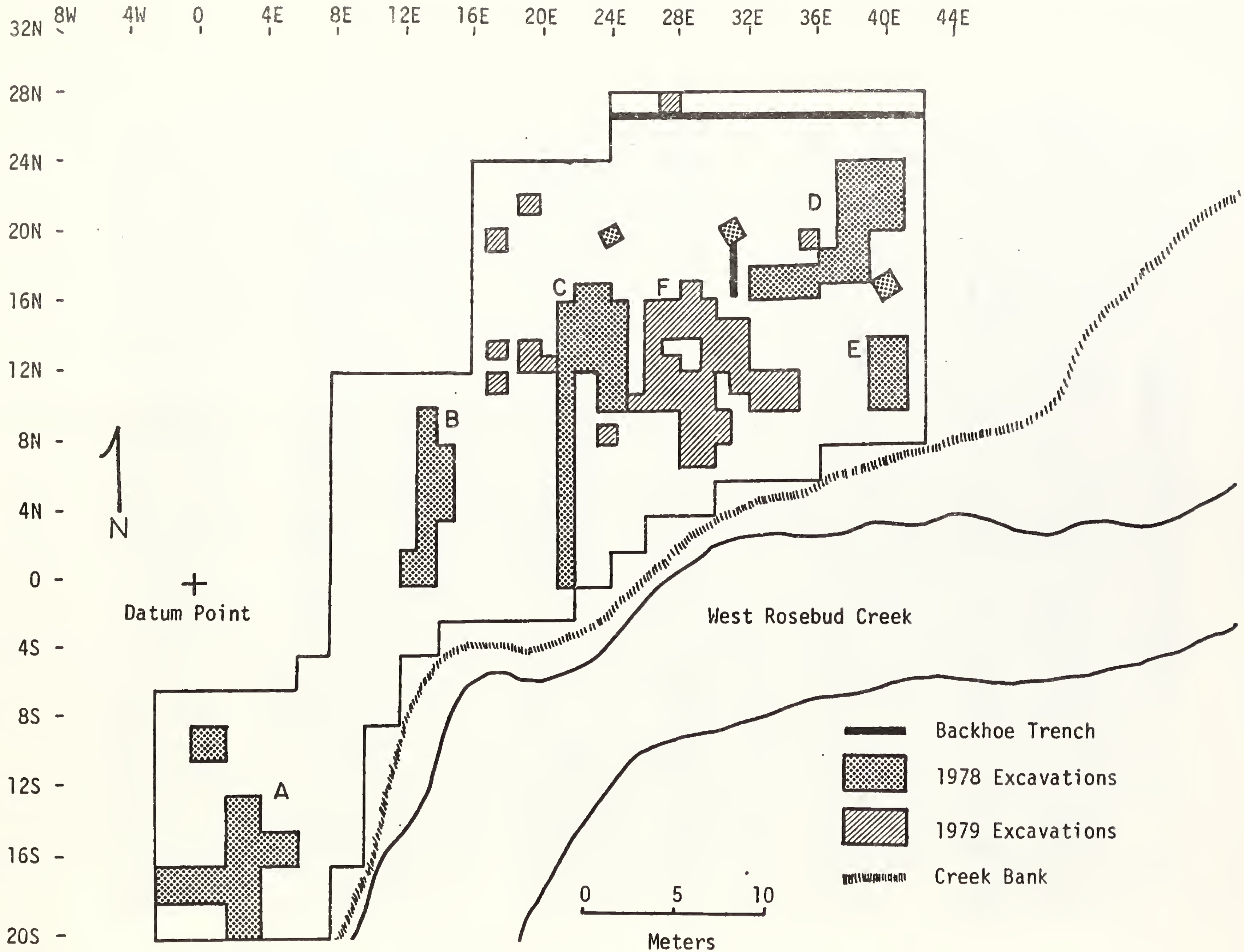


Figure 4. Excavation units at the West Rosebud Lake Site (24ST651).

Excavation was by arbitrary 5 cm units until encountering intact culture-bearing strata, at which time the arbitrary units were abandoned. In some cases the stratigraphic sequence was difficult to discern so that 5 cm units were excavated until encountering sterile soil. Soils information from these grids was later compared with the results of the soils tests and with information from surrounding grids to determine which recovered materials were from intact, cultural strata.

Soils depths were generally shallow, averaging 30 cm. In many grids, cultural material was encountered throughout the soil deposits until sterile glacial fill was reached. Soil depths increased to the north, reaching depths of 60 cm.

Eighty percent of the soil was water-screened through fine mesh window screen and all remaining soil was dry-screened through 1/4-inch mesh. The fine-screening provided for ample recovery of "micro-flakes" and microbiotic remains. Additionally, a one liter matrix sample was removed from the cultural level of each excavated quadrant for flotation studies.

All cultural materials encountered *in situ* were point plotted in relation to the grid system and to the soil zones. Photographs were taken of all significant features as well as of completed excavation units. Site mapping and stratigraphic profiles were done in the field. All excavation units were backfilled by a front end loader provided by Montana Power Company, Mystic Hydro-electric facility.

Laboratory Analysis and Curation of Artifacts

All artifacts have been cleaned, labeled with permanent ink, catalogued, and bagged. Formal tools and identifiable faunal remains have been photographed and all projectile points and diagnostic historic artifacts have been illustrated in the course of the laboratory investigation. Artifact classes include: (1) chipped stone, (2) ground stone, (3) historic items, (4) faunal remains, and (5) floral remains -- specifically seeds and pollen.

Lithic Analysis. Chipped stone artifacts received the greatest amount of attention because they were, by far, the most abundantly represented. Chipped stone artifacts were subjected to the following types of analysis:

1) *Raw Material Identification*. Materials were visually inspected and physical properties described.

2) *Typological Studies*. A thorough review of pertinent literature has been performed in order to determine if, when, and where represented point types and other diagnostic tool types occur in the archaeological record. The purpose of this study was to determine which cultural periods were represented at the site.

3) *Technological Studies.* All lithic specimens were macroscopically examined for evidence concerning lithic technology and reduction activities which occurred at the site.

4) *Functional Analysis.* Lithic use-wear analysis aimed at functional categorization of tools. All intentionally-modified specimens and a representative sample of unmodified flakes were microscopically examined for use-related edge modifications.

Floral and Faunal Analysis. All floral and faunal remains recovered from the site (other than those of obvious recent origin, *e.g.,* T-bone) have been submitted to appropriate specialists for species identification. Faunal remains were identified by T. Weber Greiser, Historical Research Associates, Missoula, Montana; seeds were submitted to Drs. Charles Miller and Sherman Preece, Department of Botany, University of Montana and a single wood specimen was submitted to Dr. Edwin Burke, Department of Forestry, University of Montana; pollen samples were prepared and interpreted by Dr. Susan K. Short, Research Associate, Institute of Alpine and Arctic Research, University of Colorado. The resultant palynological report is presented in Appendix A.

Dating Techniques. Every attempt was made to collect charcoal from pre-modern deposits for submission to Balcones Radiocarbon Laboratory, University of Texas. Unfortunately, of the four samples submitted, three were too small for dating and one produced a date of 200± B. P. (3848). It is believed that this date is erroneous and may reflect contamination from forest fires and rootlets.

All obsidian artifacts of sufficient size were submitted for obsidian hydration measurements to Dr. Leslie B. Davis, Department of Sociology, Montana State University. Dr. Davis submitted these specimens to the University of Michigan proton activation laboratory for trace element identification as supportive data for his hydration measurements. The results of these studies are presented in Appendix B.

Soils Analysis. Dr. William Shafer, consulting soils scientist, spent two days at the site familiarizing himself with the physical characteristics of the site and accumulating soil samples for laboratory analysis. A number of chemical and mechanical analyses were performed, the results of which are presented in Appendix C.

Curation of Artifacts. All notes, photographs, and other records, and most of the artifacts recovered from the West Rosebud Lake Site have been sent to Mineral Research Center for curation at the Mineral Museum, Montana Tech, Butte, Montana. A limited number of artifacts will be placed on public display in the Beartooth District Ranger Office, Red Lodge, Montana. All materials associated with the excavation of the site remain the property of the U. S. Government through the National Forest Service.

PREHISTORIC ARCHAEOLOGICAL DATA

MATERIAL CULTURE

Chipped Stone

The 1979 excavations at the West Rosebud Lake Site yielded a total of 1,676 prehistoric chipped stone artifacts including 17 formal tools, 13 modified flake tools, 1 cobble chopper, and 1,645 debitage flakes. The 1978 excavations produced a total of 1,119 prehistoric chipped stone artifacts including 44 formal tools, 48 modified flake tools, and 1,027 debitage flakes.

A wide variety of lithic materials were utilized by the various occupants of the West Rosebud Lake Site. In an attempt to identify materials by source areas and to examine the possibility of differential use of materials by the various groups who occupied the site, it is first necessary to separate and describe the represented material types (TABLE V).

The most commonly represented materials are obsidian, various cherts and jaspers, and Tongue River Silicified Sediment (TRSS) (Ahler 1977). Based on trace element analysis provided through proton activation the majority of the obsidian appears to have been derived from Obsidian Cliff in Yellowstone Park (Appendix B). Two samples are characterized by distinctive trace element composition. Their source is unknown. TRSS is known to outcrop in eastern Montana and western Rosebud Lake Site. Although never formally reported, there are supposed to be various cherts and jaspers occurring in gravels on the Beartooth Plateau.

Several factors indicate that local, variable sources were exploited. Significant is the wide variety of materials represented. Generally, if a prolific source is available locally the vast majority of materials will be of this particular type. The presence of indentifiable, modified river cobbles in the lithic inventory further supports the exploitation of handy, disparate materials, with the exception of obsidian and TRSS.

Formal tools include a variety of dart and arrow points, scrapers, knives, and drills. A number of modified flakes were recovered in addition to blanks and preforms. Only one core was recovered from the site. Following are summary descriptions of all chipped stone artifacts recovered from the site including raw materials, dimensions (Fig. 5), and pertinent formal and functional attributes for each tool category.

TABLE V. Lithic Material Types at the West Rosebud Lake Site.

1. Igneous Materials

   a. Obsidian
   b. Vitrophyre
   c. Other igneous

2. Chert: Opaque, silicates excluding reds and tans.

   a. Grey, homogeneous material with a waxy lustre
   b. White or cream chert (variable)
   c. Dark grey-to-black chert; homogeneous (variable lustre)
   d. Lavendar, mottled chert; waxy lustre
   e. Pink chert, waxy lustre

3. Jasper: Red and tan, opaque through slightly translucent silicates

   a. Red/black banded; opaque; waxy lustre
   b. Red/purple mottled; dull lustre
   c. Dark red; opaque; dull lustre
   d. Orange-red mottled; opaque; dull lustre
   e. Orange-red; slightly translucent; waxy lustre
   f. Red with white mottling; opaque; waxy lustre
   g. Red w/crystalline inclusions; homogeneous; opaque; waxy lustre
   h. Dark red; homogeneous; opaque; waxy lustre
   i. Tan/red; (variable)
   j. Tan (variable)

4. Agate/Chalcedony: Translucent silicates

   a. Dark brown agate; homogeneous; waxy lustre
   b. Banded/mottled agates (variable)
   c. Moss agate
   d. White-to-pastel chalcedony (variable)
   e. Clear agate with densely distributed dark red circular inclusions

5. Quartzite:

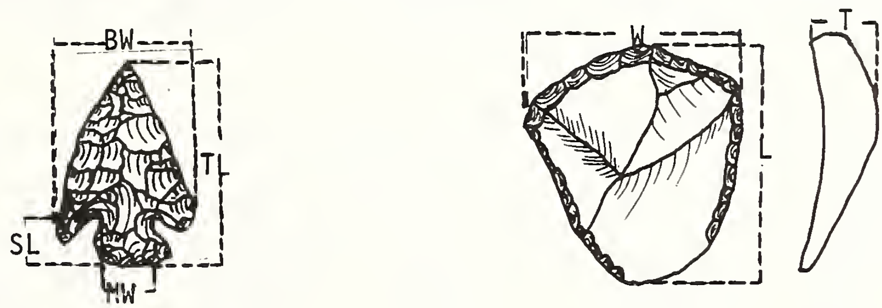
   a. Pale grey; medium-grained; lustrous
   b. Pink/lavendar; medium-grained; lustrous
   c. Dark red; medium-grained; dull lustre
   d. Brown with white, circular mottling; fine-grained; dull lustre

6. Tongue River Silicified Sediment: Grey to yellow silicified sand grains; opaque and mottled; dull lustre; relatively fine-grained (Ahler 1977:137)

7. Siltstone/Limestone

a. Light Brown siltstone; opaque; dull lustre
b. Dark grey mottled; opaque; dull lustre
c. Grey siltstone; opaque; dull lustre
d. Limestone

These numerical codes for lithic materials are used throughout the report.



TL = Total length

SL = Stem length

BW = Maximum blade width

NW = Minimum neck width

T = Maximum thickness

L = Maximum length (proximal to distal, when observable)

W = Maximum width

T = Maximum thickness

Figure 5. Illustrations showing formal attribute measurements for lithic tools.

Projectile Points

Within the assemblage of 26 diagnostic projectile points, five general categories are discernible (Fig. 6). These include (1) large side-notched points which are believed to date to the Early Archaic Period; (2) Duncan-Hanna variants of the McKean Complex which dates to the Middle Archaic Period, (3) corner-notched and corner-removed points which date to the Late Archaic Period; (4) small side-notched arrow points and (5) small stemmed arrow points which date to the Late Prehistoric Period.

(1) Large Side-Notched Projectile Points (3) (Table VI) (Figure 7 d-f)

Table VI. Large Side-Notched Projectile Point Data

Specimen #	C-F	Dimensions NW	SW	T	Lithic Material	Blade Shape	Base Shape	Basal Grinding	Notches	Use-Wear	Ill. #
79/131	F	15	20	5	Chert (2c)	convex	convex	X	broad	*	6a
78/96	F	15	20	4	Chert (2c)	-	straight	X	broad		6b
78/1	F	13	19	4	Obsidian(1a)	-	slightly convex	X	broad		6c

* Use-wear on 79/131 is in the form of crushing along the edge which had been previously fractured. Crushing and micro-flaking are confined to one face which indicates a scraping motion.

These large, side-notched specimens are similar to those reported from the Mount Albion Complex of the Central Rockies (Benedict & Olson 1978), Mummy Cave, Levels 23-24 (McCracken, *et al.*, 1978), the Hawken Site (Frison *et al.*, 1976), and the Myers-Hindman Site (Lahren 1976) -- all in the Northwestern Plains. Dates for these materials range from 5600-4000 B. C. which corresponds with the Early Plains Archaic Cultural Period.

(2) Duncan-Hanna Projectile Point Data (3) (Table VII) (Figure 7 a-c)

Table VII. Duncan-Hanna Projectile Points

Specimen #	C-F	Dimensions TL	SL	BW	NW	T	Lithic Material	Blade Shape	Base Shape	Basal Grinding	Use-Wear	Ill. #
78/33	F	-	10.5	23	12	7	Vitrophyre (1b)	-	concave			6d
78/31	C	48	14	18	13	6	Jasper (3j)	convex	concave	X	*	6e
78/18	C	40	10	18	12	4	Quartzite (5a)	convex	concave	X		6f

*Edge crushing with subsequent stabilization and rounding on specimen 78/31 indicates that this projectile point also served as a cutting tool. It apparently became dull and was resharpened at least once as is evidenced by flake patterns and edge beveling.

Comparable specimens of Duncan and Hanna points have been observed throughout the Central and Northwestern Plains (Frison 1978, Greiser 1980, Mulloy 1958, Strong 1935). The McKean complex dates from approximately 3000 - 1000 B.C., during the Middle Archaic Cultural Period.

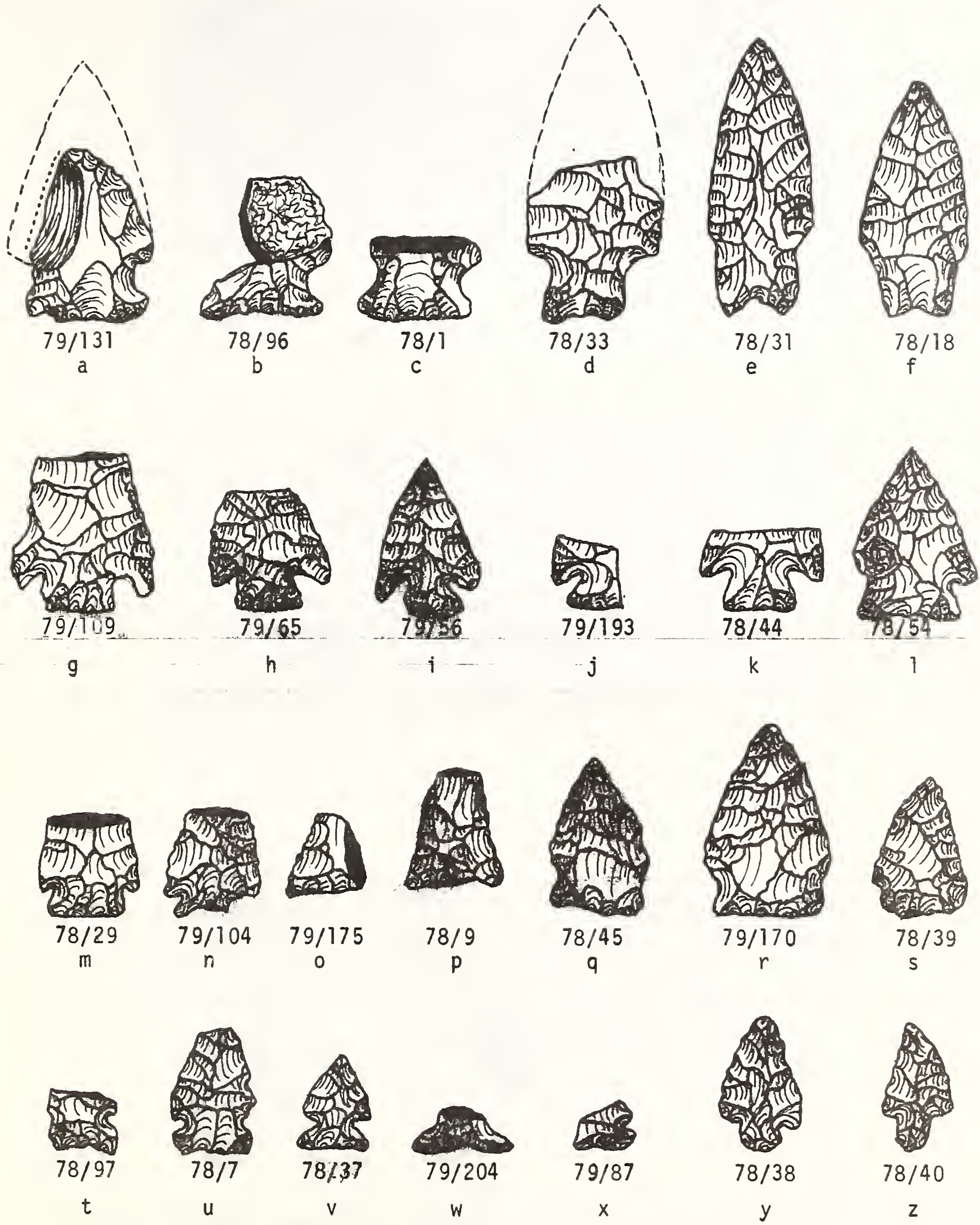


Figure 6. Projectile points from the West Rosebud Lake Site.

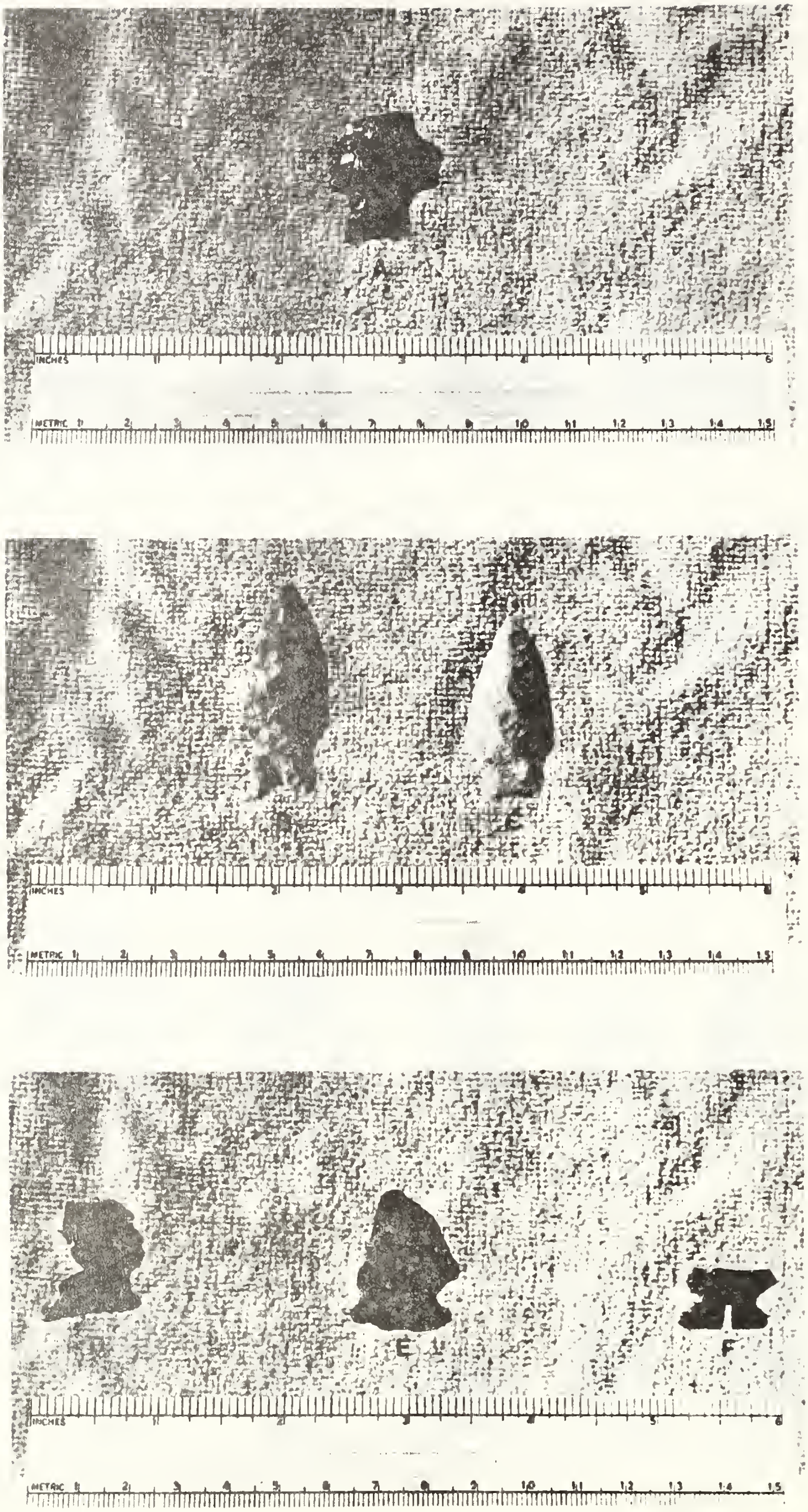


Figure 7. Photographs of Duncan-Hanna Projectile Points (A-C) and Large Side-Notched Projectile Points (D-F).

(3) Corner-Notched and Corner-Removed Projectile Point Data (13) (Table VIII) (Figure 8 a-j)

Table VIII. Corner-Notched and Corner-Removed Projectile Point

Specimen #	Dimensions						Lithic Material	Blade Shape	Base Shape	Obsidian Hydration Age	N.C.*	Use-Wear	Ill. #
	C-F	TL	SL	BW	NW	T							
79/109	F	-	7	24	12	6	(2c) Chert	slightly concave	straight		a	*1	6g
79/65	F	-	7	20	8	4	(1a) Obsidian	straight	slightly convex	220 BC	b		6h
78/56	C	26	6	18	5	3	(1a) Obsidian	straight	straight	220 BC	b		6i
79/193	F	-	6	-	-	3.5	(1a) Obsidian	-	straight	370 BC	b		6j
78/44	F	-	7.5	20	9	4	(2d) Chert	-	straight		b		6k
78/54	C	28	7	22	14	4.5	(4d) Agate	straight	straight		c		6l
78/29	F	-	5	18	11	4	(3f) Jasper	straight	straight		d		6m
79/104	F	-	3.5	16	9	4	(1a) Obsidian	straight	slightly concave	AD 130	d		6n
79/175	F	-	-	-	-	4	(1a) Obsidian	straight	-	570 BC	d		6o
78/9	F	-	-	17	-	5	(1a) Obsidian	slightly concave	-		d	*2	6p
78/45	C	27	6	17	14	4	(1a) Obsidian	straight	slightly convex	AD 330	e		6q
79/170	C	32	7	20.5	16	5	(4a) Agate	straight	straight		e	*3	6r
78/39	C	24	2	16	-	4	(1a) Obsidian	straight	straight	AD 230	e		6s

*Notching Characteristics:

a. Deep rounded notches from basal side of corner, forming hooked barbs. Stem is only slightly flared and narrower than the blade.
b. Deep notches which are angled from corner so as to create an expanding stem which is narrower than the blade.
c. Broad notches which are angled from corner so as to create a slightly expanding stem which is approximately the same width as the blade.
d. Narrow corner notches placed nearly perpendicular to the blade axis which creates straight shoulders. Stem is nearly as wide as the blade.
e. Shallow corner "indentations" which create gently sloping shoulders.

Use-Wear:

*1 79/109 displays a small area of slight edge crushing just below the break. The break itself is not rounded. This "projectile point" apparently also functioned as a cutting tool until the blade snapped, at which time it was discarded.

*2 78/9 displays heavy crushing along both edges. The use of this tool for cutting has significantly modified the edges which were originally straight and the blade was wider.

*3 79/170 has also been used as a cutting tool as is evidenced by moderate crushing and subsequent rounding of both edges. Minor beveling indicates that the tool was re-sharpened at one time.

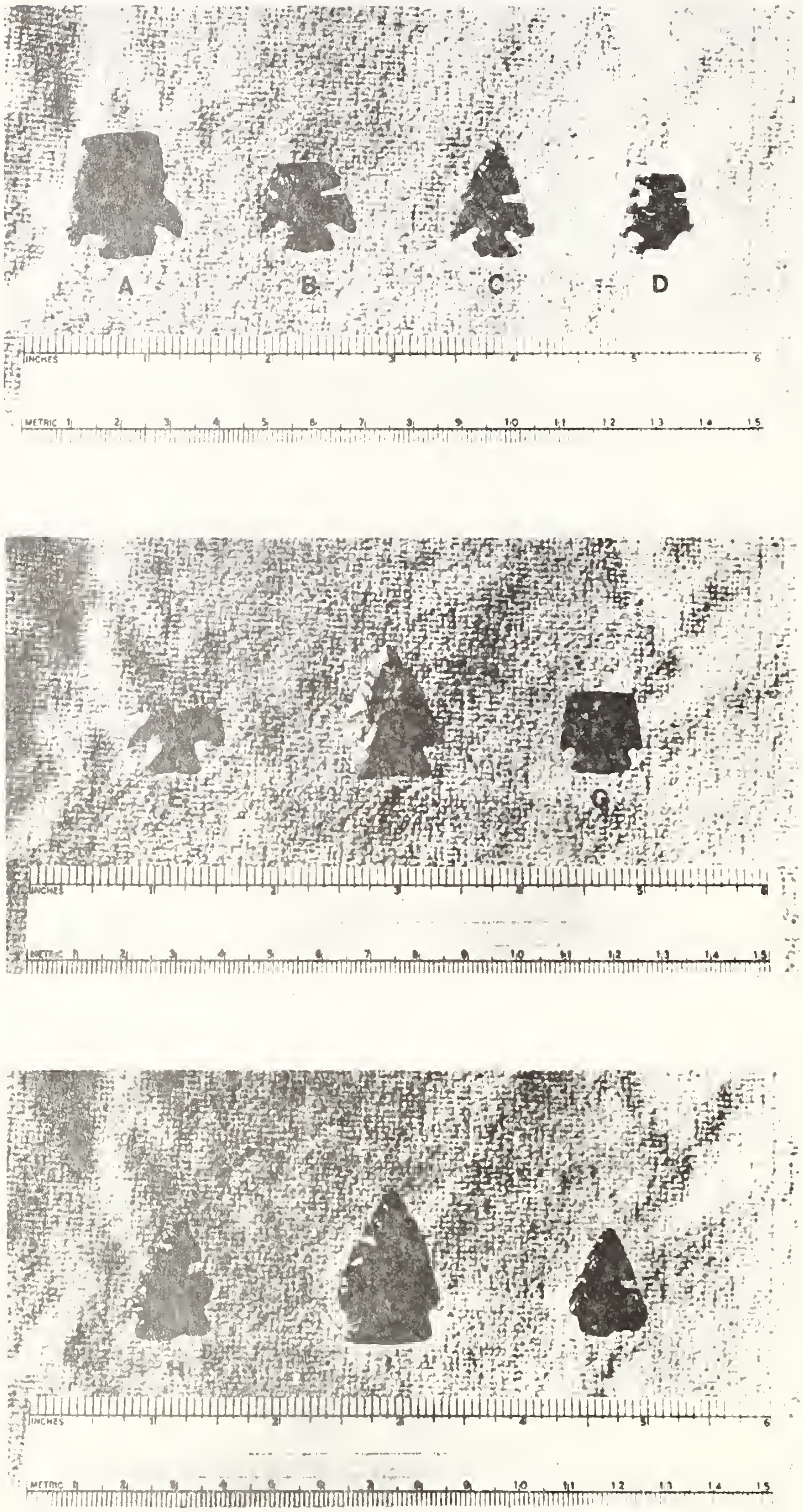


Figure 8. Photographs of Corner-Notched (A-G) and Corner-Removed (H-J) Projectile Points. (Photographed after removal of obsidian samples.)

Corner-notched points appear in the archaeological record throughout the Plains and Intermontane areas around 1,000 BC and continue until approximately AD 500. Although generally classified under the rubric "Pelican Lake," there is a high degree of variability within this complex (Reeves 1974). Corner-notched points are a definitive attribute of Late Archaic occupations.

All of the obsidian hydration dates for the corner-notched and corner-removed projectile points fall within the time period noted above. The degree of accuracy on a fine scale within this period is unknown.

Specimen 79/104 may represent the earliest form of Avonlea points, Kehoe's "Classic Gull Lake Avonlea" (1973:50). The obsidian hydration date of AD 130 places it in a transitional Pelican Lake-Avonlea slot. Since the more classic Pelican Lake points cluster between 370-220 BC it is possible that this point is a single diagnostic representative of an Avonlea occupation.

(4) Small, Side-Notched Projectile Point Data (5) (Table IX) (Figure 9 a-d)

Table IX. Small, Side-Notched Projectile Points

Specimen #	C-F	Dimensions					Lithic Material	Blade Shape	Base Shape	Notches	Use-Wear	Ill. #
		TL	SL	BW	NW	T						
78/97	F	-	7	12	9	2.5	(3d) Jasper	-	concave	shallow		6t
78/7	F	-	7	15	9	3	(3e) Jasper	straight	straight	shallow		6u
78/37	C	15	5	11	7	3	(3h) Jasper	straight	straight	shallow		6v
79/204	F	-	6	-	8	3	(2b) Chert	-	concave	deep		6w
79/87	F	-	4	-	-	2.5	(7a) Siltstone	-	concave	shallow		6x

Small, side-notched arrow points appeared widely across the Plains and mountains during the first millenium A.D. A wide variety of arrow point styles have been recognized, all of which date to the Late Prehistoric Period (Kehoe 1973). There is some question as to the usefulness of these highly specific typologies. Undoubtedly much of the variability can be attributed to individual preference, flake blank characteristics, and raw materials. On the other hand, there does seem to be gradual change in point morphology through time.

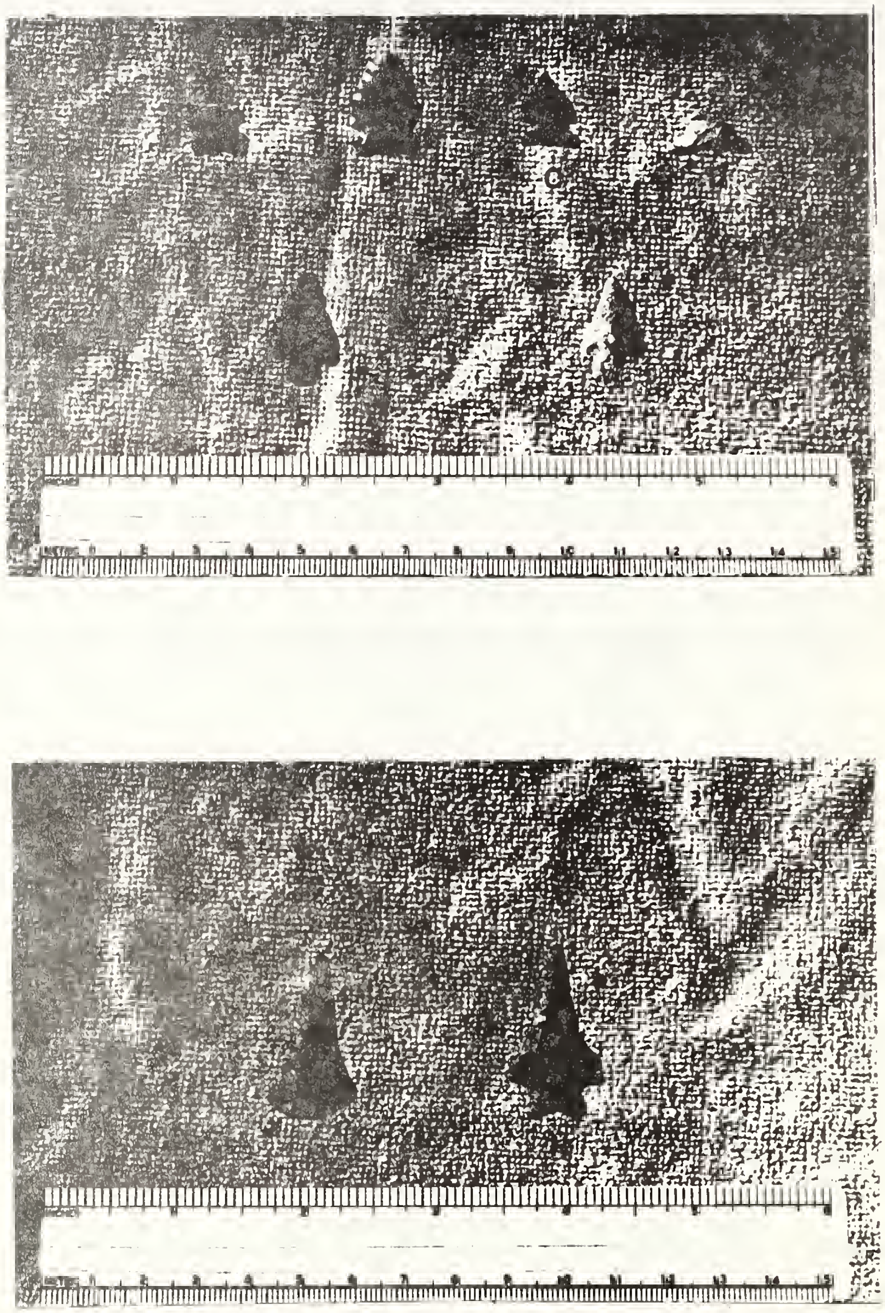


Figure 9. Photographs of Small Side-Notched Projectile Points (A-D), Small Stemmed Projectile Points (E-F), and Drills (G-H).

(5) Small, Stemmed Projectile Point Data (2) (Table X) (Figure 9 e-f)

Table X. Small Stemmed Projectile Points

Specimen #		Dimensions					Lithic Material	Blade Shape	Base Shape	Use-Wear	Ill. #
	C-F	TL	SL	BW	NW	T					
78/38	C	23	5	14	7	3	(5c) Quartzite	irregular	convex		6y
78/40	C	21	7	12	6	3	(3j) Jasper	straight	convex		6z

These small, stemmed projectile points are unusual on the Northwestern Plains. I was unable to find any reference to such points except as "accidental" occurrences within assemblages of Late Prehistoric side-notched points.

A number of undiagnostic projectile point fragments were also recovered from the site (Table XI).

Table XI. Undiagnostic Projectile Point Fragments

Specimen #	Portion Present	Lithic Material	Estimated Cultural Period	Illustration #
78/4	basal fragment	TRSS (6)	Late Plains Archaic	10a
78/64	basal fragment	Obsidian (1a)	?	10b
78/71	basal fragment	Jasper (3h)	Late Prehistoric	10c
78/51	tip	Jasper (3d)	Late Plains Archaic	10d
79/16	tip	Obsidian (1a)	Late Prehistoric	10e
78/78	midsection	Jasper (3d)	Late Prehistoric	10f
78/13	shatter*	Jasper (3i)	Middle Plains Archaic	10g
78/93	tip	Jasper (3a)	Middle Plains Archaic	10h
79/192	edge fragment	Obsidian (1a)	?	-
79/18	edge fragment	Obsidian (1a)	?	-

Cutting Tools (Bifaces)

There is a surprising lack of bifacial cutting tools in the West Rosebud Lake Site assemblage. Only five biface specimens with finished edges were recovered and these are all fragmentary (Table XII).

Table XII. Finished, Bifacial Tool Fragments

Specimen #	Portion Present	Lithic Material	Use-Wear
78/82	midsection fragment	Jasper (3h)	No apparent use-wear
78/70	basal fragment	Siltstone (7a)	No apparent use-wear
78/50	edge fragment	Jasper (3h)	No apparent use-wear
79/1	midsection	Chert (2b)	No apparent use-wear (surface find)
78/47	midsection fragment	TRSS (6)	Edge crushing

These fragments have been categorized as cutting tools based on formal characteristics. The small size of the specimens prohibited thorough use-wear examination, except in the one case.

Piercing and Incising Tools (Fig. 9 g-h)

Three tools which were used for piercing or incising tasks were recovered from the site. These include two drills and one graver (Table XIII).

Table XIII. Piercing and Incising Tools

Specimen #	Tool Type	Dimensions L	W	T	Lithic Material	Use-Wear
79/189	drill	35	13	4	Chert (2a)	Tip rounding and edge crushing on upper edges.
78/57	drill	32	17	4	Agate (4b)	Tip rounding and edge crushing on upper edges.
78/88	graver	31	21	6	Chert (2b)	Tip is blunted and minute flake scars extend off one side of tip.

Scraping Tools (Unifaces) (Fig. 10-11)

The general category of scraping tools includes formal end scrapers, intentionally modified side scrapers, and numerous utilized flakes which display evidence of unifacial use-retouch resulting from scraping activities. A total of 38 scraping tools and several additional uniface fragments were recovered from the West Rosebud Lake Site (Table XIV). Nearly half of these (15) are flakes which have been modified through use. Accordingly, only 23 intentionally modified scraping tools were recovered.

A number of variables are considered to aid in the reconstruction of activities represented by these tools. Generally, a wide variety of tasks are included under the rubric "scraping," such as hide scraping, wood and bone scraping, and fiber processing. In order to determine actual uses of individual tools it is necessary to consider factors such as edge angle, edge curvature, and use-wear patterns. Determining whether or not correlations exist among these variables helps us to understand the range of activities represented at the site.

Table XV summarizes the scraping tool categories represented at the site. Based on use-wear observations it has been determined that little or no hide or vegetable fiber scraping is represented by these abandoned tools. When such supple materials are scraped there is a tendency for a polish to form along the entire scraping edge and extend slightly onto both surfaces. Edge polish is not a common characteristic of the West Rosebud Lake specimens and when present, it is restricted to the extreme edge and flake ridge convexities. Based on the types of wear observed it is suggested that most of the scraping activities at West Rosebud Lake involved resilient materials such as wood, bone, or antler.

Surprisingly, there is little variation in wear-patterns from one edge shape to another. Edge angle appears to influence the resultant wear-patterns the most, although raw material is another important factor. All of the intentionally modified scraping tools are manufactured from jasper, chert, and agate. Obsidian is only represented in the category of use-modified flakes with edge angles less than 40°. This pattern must reflect the makers' knowledge of material properties.

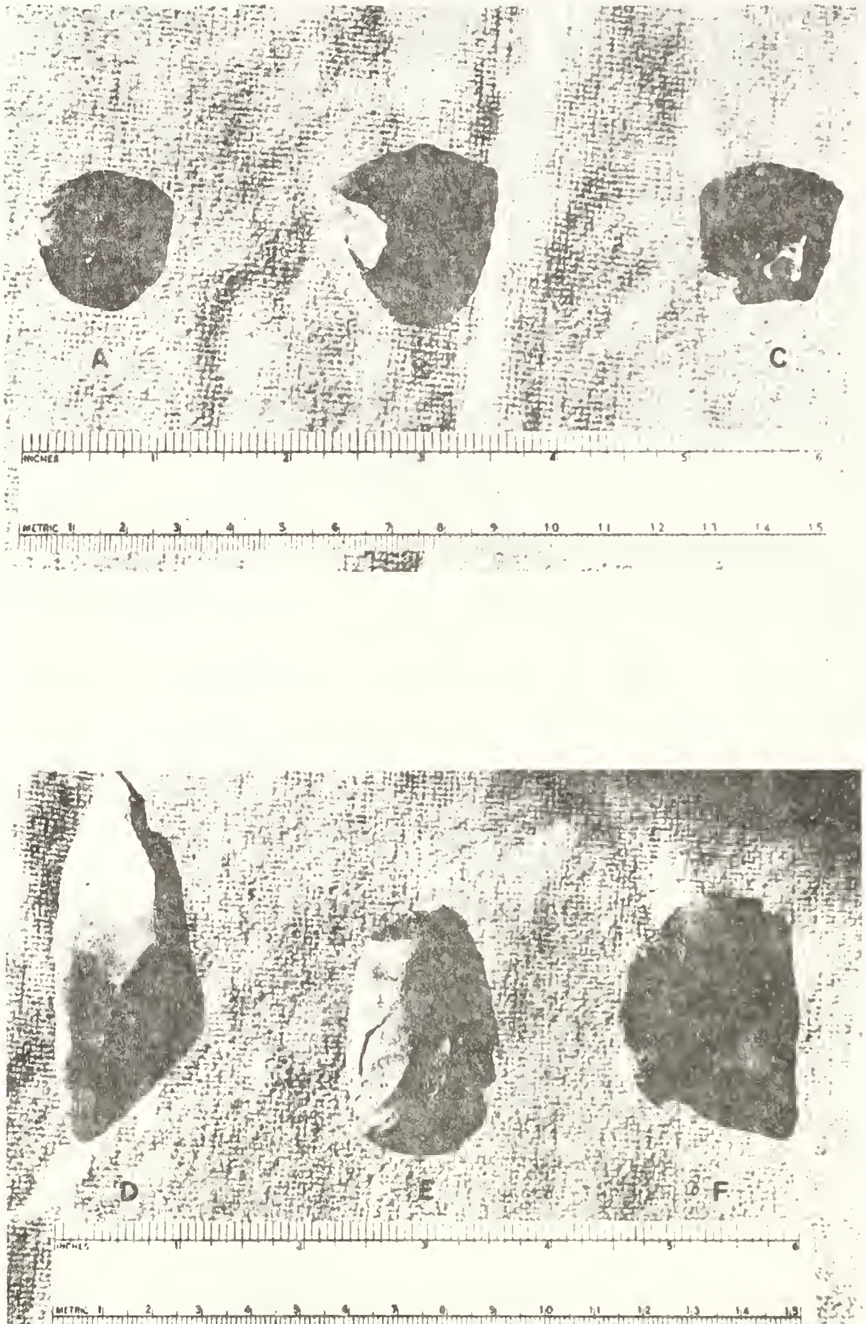


Figure 10. Photographs of Scraping Tools.

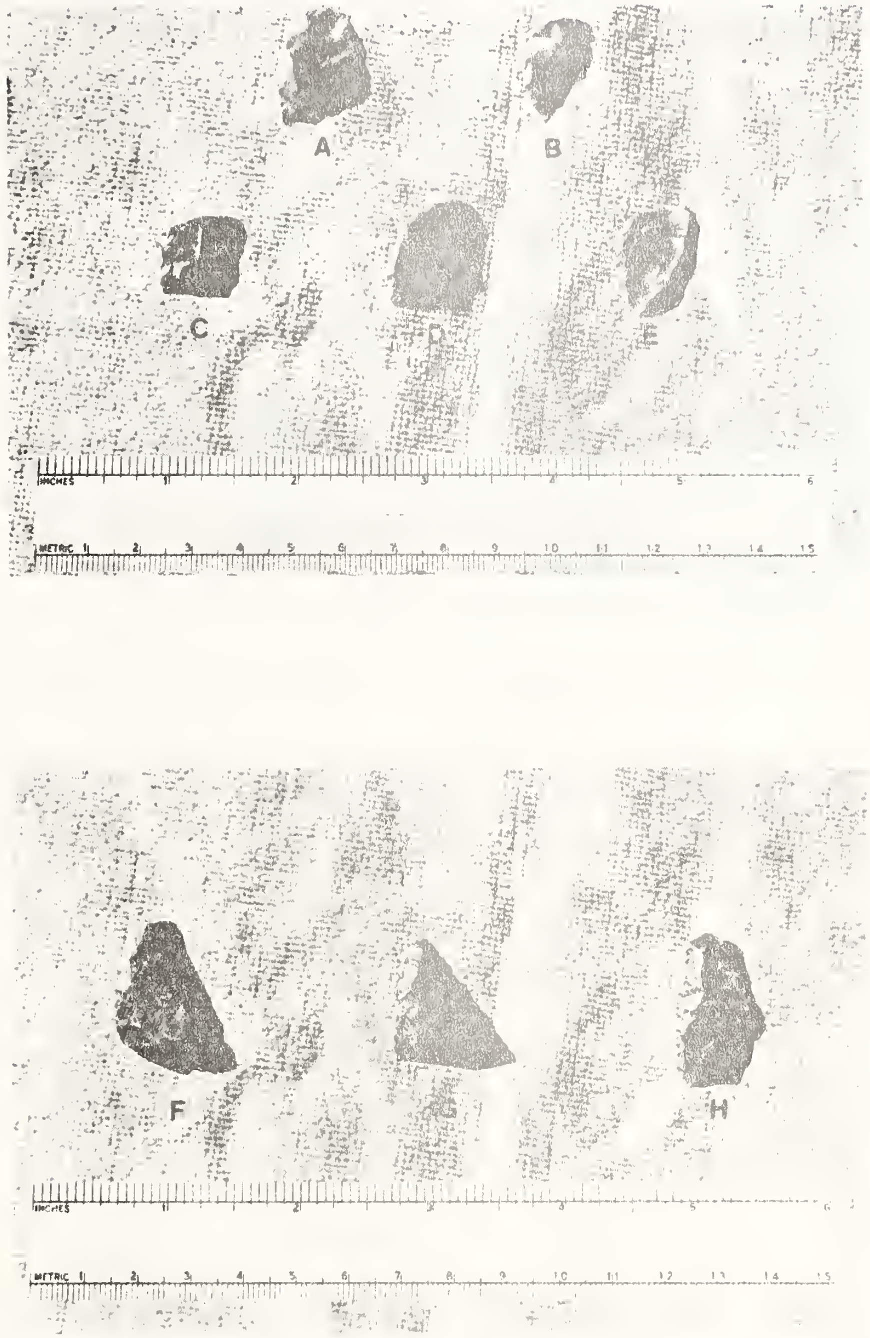


Figure 11. Photographs of Scraping Tools and Fragments.

Table XIV. Scraping Tools.

Specimen #	C-F	L	W	T	Lithic Material	Working Edge Angle	Working Edge Shape	Use-Wear	Fig. #
78/41	C	55	32	9	2e	55°	convex	crushing, rounding and polish	
78/15	F	-	17	3.5	3e	50°	convex	crushing, rounding and polish	
78/20	C	23	19	4	3f	50°	convex	light crushing	
79/172	C	36	33	10	4b	75°	convex	heavy crushing, rounding	
79/51	C	28	27	6	4a	65°	convex	crushing, polish	
78/53	C	27	26	8	4a	85°	convex	heavy crushing, rounding	
78/48	C	22	17	5	3f	90°	straight	light crushing on resharpened edge	
78/19	F	-	32	10	2d	70°	convex	rounding, polish	
79/177	C	25	18	5	4b	70°	convex	step fracturing and light polish along flake ridges	
78/49	F	-	-	7	3i	75°	convex	heavy crushing, rounding	
78/80	F	-	-	-	3e	68°	convex	step-fracturing, light rounding and polish	
78/26	F	-	20.5	6	3i	70°	straight	light step-fracturing on resharped edge	
79/90	C	39	28	9	3b	85°	straight	heavy crushing, step-fracturing	
78/36	F	-	33	7	3j	70°	convex	crushing, step-fracturing	
78/42	F	-	-	7	3a	65	straight	step-fracturing (?)	
78/17	C	49	35	7.5	4b	70°	straight	crushing, step-fracturing	
78/95	C	31	17	4	4a	55°	straight	rounding, resharpened	
78/14	C	79	31	13	2e	50°	straight	No visible use-wear	
78/25	F	-	44	6	7c	50°	straight	No visible use-wear	
78/12	C	45	20.5	3	2b	25°	straight	use-retouch on unmodified edge, rounding, polish	
78/63	C	13.5	22	3	1a	60°	straight	crushing rounding	
78/98	C	26	24	4	1a	35°	convex	use-retouch, rounding	
78/74	F	18	27	5	5e	30°	straight	use-retouch, rounding	
79/15	C	24	16	4	1a	30°	straight	use-retouch	
78/60	C	23	26	3.5	1a	28°	straight	use-retouch	
78/16	F	-	16	4	1a	25°	straight	use-retouch	
78/24	F	-	10	3.5	1a	45°	concave	crushing	
79/56	C	21	14	3	3d	28°	straight	use-retouch	
79/194	F	-	12	2	3c	40°	convex	use-retouch	
78/72	F	-	-	4	2b	45°	convex	crushing, rounding & polish	
79/195	C	23	16	4	2a	40°	concave	use-retouch, crushing	
78/61	F	-	-	7	7a	38°	convex	crushing, rounding	
78/91	F	-	23	4	2b	25°	straight	use-retouch	
78/75	F	-	-	9	3c	35°	straight	use-retouch	
79/173	C	31	16	2.5	3j	22°	concave	use-retouch	
78/55	C	38	14	3	4e	20°	straight	use-retouch	
78/79	C	29	21	6	3h	20°	straight	use-retouch	
78/28	F	-	-	3.5	2c	20°	straight	use-retouch, sounding	

Table XV. Functional Categorization of Scraping Tools. (After Gerstle and Greiser 1977).

	CONVEX		STRAIGHT		CONCAVE
$\bar{x}$ Edge Angle	46°	72°	26°	67°	36°
Edge Angle Range	35°-58°	65°-85°	20°-35°	50°-90°	22°-45°
# of Specimens	7	8	11	9	3
Use-Wear	Light-to-moderate crushing and edge rounding. 3 specimens display limited polish. 2 specimens display use-retouch rather than intentional modification.	Heavy crushing with subsequent edge rounding. 4 specimens display limited polish and 2 display step-fracturing.	All are use-modified flakes with small use-retouch flakes extending onto face. 3 specimens display rounding and 1 displays light polish.	Moderate-to-heavy crushing and step-fracturing. 3 specimens have been resharpened. 2 show no visible use-wear.	Light crushing, use-retouch.
Lithic Materials	Jasper - 3 Chert - 2 Obsidian - 1 Siltstone - 1	Jasper - 3 Chert - 1 Agate - 4	Jasper - 3 Chert - 3 Agate - 1 Obsidian - 3 Quartzite - 1	Jasper - 4 Chert - 1 Agate - 2 Obsidian - 1 Siltstone - 1	Jasper - 1 Chert - 1 Obsidian - 1
Suggested Uses	Scraping moderately resilient material e.g. soft wood	Scraping resilient material, e.g. wood, bone antler	Scraping moderately resilient material e.g. soft wood	Scraping resilient material e.g. wood, antler, bone	Whittling resilient material, e.g. wood or bone

Chopping Tools

Three chopping tools are present in the assemblage (Table XVI). These include two flake choppers and one cobble chopper (Figure 11).

Table XVI. Chopping Tools

Specimen #	Dimensions L	W	T	Lithic Material	Use-Wear	Ill. #
79/196	-	65	21	Limestone (7d)	battered edge	11a
78/46	110	57	25	Quartzite (5b)	battered edge	11b
79/205	240	115	60	Granite	battered edge	11c

Blanks and Preforms

Unfinished artifacts are categorized as blanks or preforms depending on the stage of reduction represented. Blanks are those artifacts which have been modified, yet remain unfinished, and "have the morphological potential to be modified into more than one implement type within the assemblage," (Bradley 1975:5). Preforms, on the other hand, are unfinished specimens "which have the morphological potential of being modified into only one implement type within the assemblage" (Bradley 1975:6).

Within the West Rosebud Lake assemblage there are 9 bifacially-modified blanks and blank fragments and 11 preforms (Fig. 12) and preform fragments (Table XVII). The reason for abandoning each piece is usually clear. The two most common problems are (1) that the piece broke during manufacture and (2) that the piece couldn't be thinned enough to be suitable.

Debitage

All flakes which show no sign of edge retouch are categorized as debitage. Debitage is the waste material resulting from tool manufacture and resharpening. Debitage flakes will vary in size and shape depending upon the stage of manufacture they represent, the type of tool and method used to detach the flake, and the raw material of the flake.

Flakes are usually described in terms of primary versus secondary reduction, final shaping, and resharpening flakes. Visual inspection of all 2672 debitage flakes collected from West Rosebud Lake indicated that few of the flakes represented primary reduction. This is based on

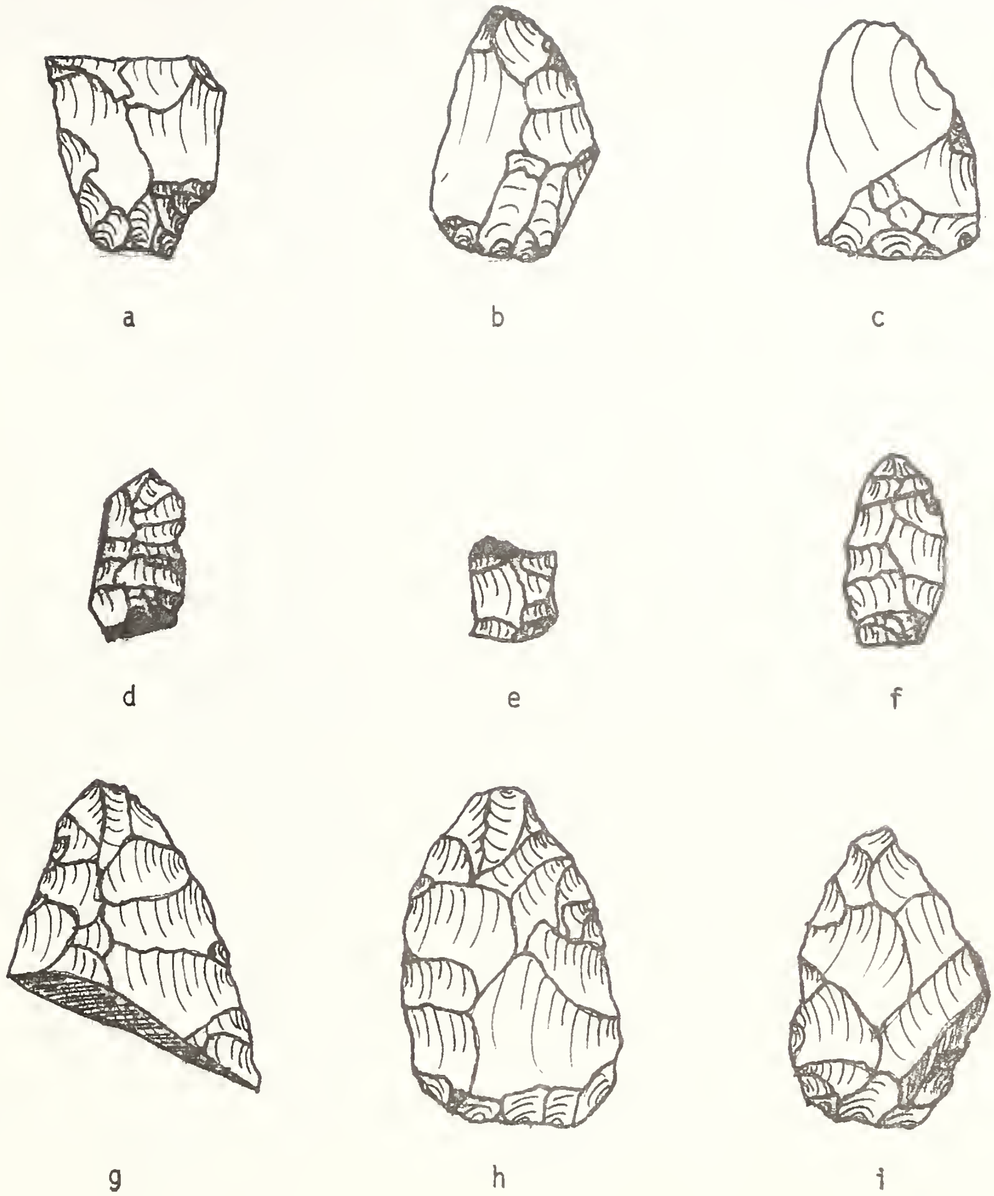


Figure 12. Selected biface preforms.

Table XVII. Blanks and Preforms

Specimen #	Dimensions L	W	T	Lithic Material	Reduction Category	Ill. #
78/32	-	-	7	Vitrophyre (1b)	Biface Blank Fragment	
78/21	-	30	5	Chert (2d)	Biface Blank Fragment	
78/2	40	-	8.5	Jasper (3i)	Biface Blank Fragment	
79/24	-	29	10	Jasper (3a)	Biface Blank Fragment	
79/132	-	29	12	Jasper (3a)	Biface Blank Fragment	
78/86	-	29	9	Chert (2e)	Biface Blank Fragment	
78/22	-	28	6	Agate (4d)	Biface Blank Fragment	
78/43	-	-	8	Jasper (3j)	Biface Blank Fragment	
79/191	-	-	10	Agate (4a)	Biface Blank Fragment	
78/83	-	23	5	Jasper (3a)	Projectile Point Preform	12a
78/23	33	20	5	Obsidian (1a)	Projectile Point Preform	12b
78/58	30	20.5	5	Chert (2d)	Projectile Point Preform	12c
78/35	-	-	3	Obsidian (1a)	Projectile Point Preform	
78/27	-	-	3.5	Agate (4a)	Biface Blank Fragments	
78/73	-	-	2.5	Jasper (3a)	Projectile Point Preform	12d
78/5	-	-	4	Obsidian (1a)	Projectile Point Preform	12e
78/65-66	21	13	2.5	Vitrophyre (1b)	Projectile Point Preform	12f
78/81	-	-	9	Quartzite (5d)	Knife Preform	12g
78/30	45	34	11	Jasper (3i)	Knife Preform	12h
79/197	38	25	10	Chert (2e)	Knife Preform	12j

the relatively small size of most flakes and the general lack of cortex on flakes, and is supported by the lack of cores at the site. Manufacturing appears to have involved reduction from flake blanks, with few exceptions. Accordingly, flakes represent secondary and final reduction as well as tool resharpening.

As revealed by flake shape and platform characteristics it appears that flakes between 1-3 cm. in length are generally secondary shaping flakes and those under 1 cm. are final shaping and resharpening flakes. The distribution of flakes by size is presented in Appendix D. Seventy-one percent of the flakes were less than 1 cm. in length. A greater proportion would have been represented if fine-screening had been carried out for the entire excavation. In Area F where all the soil matrix was fine-screened, 93% of the flakes measured less than 1 cm. in length. As the flake size increases, the number represented decreases. Specifically, 22% of the flakes measured between 1 and 2 cm., 5% measured between 2 and 3 cm., and the remaining 2% were longer than 3 cm. These figures demonstrate that the vast majority of debitage represents the final stage of manufacture and resharpening of work tools.

A sample of 150 resharpening flakes was examined to ascertain whether they originated from a bifacial or unifacial tool. Frison (1968) describes platform attributes which indicate the type of tool from which the flake was removed. Briefly, a resharpening flake which has been struck from a biface will exhibit a faceted striking platform which is at an acute angle from the back of the flake, and the dulled tool edge is visible. A resharpening flake which has been removed from a dulled-scraping edge of a uniface will exhibit a platform which is generally at right angles to the adjacent portion of the back of the flake. Use-wear of the kind common to scrapers will be observable on the resharpening flakes. Side-scraper resharpening flakes are generally larger than end-scraper resharpening flakes, otherwise their characteristics are similar.

Sixty-eight percent of the sample of resharpening flakes were determined to be from bifaces and the remaining 32% were from unifacial scraping tools. No attempt to distinguish end-from side-scrapers was made. It should be noted that all the flakes in the sample were from Area F where obsidian is the predominant material. Had other materials been more prevalent the results may have differed substantially.

Lithic Material Selection

Observations concerning the relationship between functional tool categories and raw material selection at West Rosebud Lake are interesting (Table XVIII).

Table XVIII.
Functional Tool Categories and Raw Material Selection.

	Obsidian	Vitrophyre	Chert	Jasper	Agate	Quartzite	TRSS	Siltstone	TOTALS
Projectile Points	12	1	5	12	2	2	1	1	36
Formal Scrapers	0	0	3	9	6	0	0	1	19
Impromptu Scrapers	6	0	5	5	1	1	0	1	19

It has been hypothesized that in prehistoric lithic industries "raw material selection occurred principally for functional reasons" (Greiser and Sheets 1979:295). One-third of the projectile points from the site are obsidian whereas nearly all of the "formal" scraping tools are dense cherts and jaspers, and none are obsidian. This dichotomy was expected based on controlled experiments which have demonstrated that obsidian loses its working edges through rapid attrition much faster than comparable specimens of chert, jasper, or chalcedony (Greiser and Sheets 1979:295). The impromptu scraping tools are more disparate and appear to have been selected on the basis of edge size and shape rather than lithic material.

Another interesting outcome of the investigation of tool use and raw material variation within the West Rosebud Lake assemblage is the apparent preference for black projectile points (50%). Furthermore, if we categorize the projectile points by cultural period it becomes apparent that it was the Early and Late Archaic Period Occupants who strongly preferred black materials (Table XIX). Only one of the projectile points from the remaining cultural periods was manufactured from a black material.

Table XIX. Projectile Points and Lithic Material Selection.

	BLACK				OTHER				TOTAL	%BLACK
	Obsidian	Black Chert	Vitrophyre	Dark Brown Agate	Light Cherts	Light Agates	Jasper	Quartzite		
Early Archaic (Large Side-Notched)	1	2							3	100%
Middle Archaic (McKean Complex)			1				1	1	3	33%
Late Archaic (Corner-notched, Corner-removed)	7	1		1	2	1	1		13	69%
Late Prehistoric (Small arrow points)					2		4	1	7	-0-
TOTAL	8	3	1	1	4	1	6	2	26	

Unfortunately other tool categories are not well enough represented to investigate raw material preferences.

Ground Stone

A single ground stone item was recovered from the West Rosebud Lake Site. This is a pendant made from a flat pebble which has been drilled (Fig. 13). It is classified as ground stone because it appears that the natural shape of the stone was enhanced through slight grinding. No ground stone food processing tools were observed.

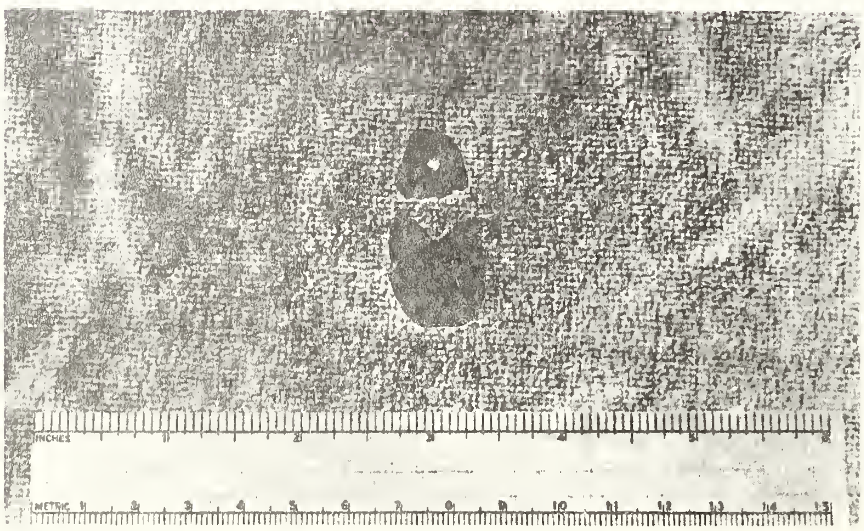


Figure 13. Pebble Pendant from Area D, West Rosebud Lake Site.

FEATURES

Prehistoric Hearths/Charcoal Stains

During the 1979 excavations a total of 25 hearths or charcoal stained features were recorded. Similar features were noted during the 1978 excavations, yet no details are available. In Area F, 15 such features were observed which were roughly circular and ranged in diameter from 20-70 cm. (Fig. 14). These features range in character from diffuse, charcoal-stained concentrations to simple, unlined hearths which are roughly circular and are saucer-shaped in cross-section. One charcoal-stained feature also contained approximately 15 fragments of fire-cracked rocks.

The saucer-shaped charcoal concentrations appear to represent hearths yet there is no indication as to the specific uses of the fires. No biotic remains were found within these burned areas to indicate cooking although tiny fragments of burned bone were recovered from a few areas of the excavation. Two of the best preserved hearths were within the same grid quadrant (Fig. 15a) and one was nearly superimposed upon the other. This placement, in addition to the integrity of the features, indicates two occupations in this particular part of the site. Unfortunately neither hearth produced enough charcoal for radiocarbon dates.

The single charcoal-stained area which contained fire-cracked rock is also difficult to interpret. The rocks were within the stained area rather than around the periphery and may have served as "boiling stones" or for roasting.

The diffuse, charcoal stained concentrations may represent hearths which, prior to breaking camp, served as refuse dumps for faunal and floral waste. This would explain the high organic content of these areas. The wavy borders of these features indicate that the charcoal and organic debris settled out in solution. Maybe the occupants doused their fires with water as they were leaving camp. In some cases these charcoal-stained areas were associated with numerous fist-sized cobbles which showed no evidence of burning (Fig. 15b).

Prehistoric Post Molds

Three post molds were located in the southern portion of Area F (see Fig. 14). These are circular features approximately 6 cm. in diameter which are distinguishable from the surrounding matrix by their dark organic content (Fig. 16a). They differ in appearance from rodent holes in their texture and especially their shape (Fig. 16b). Whereas rodent holes generally maintain the same diameter and they angle off to run parallel to the ground surface these post mold features narrow to form a pointed tip and extend perpendicular to the ground.

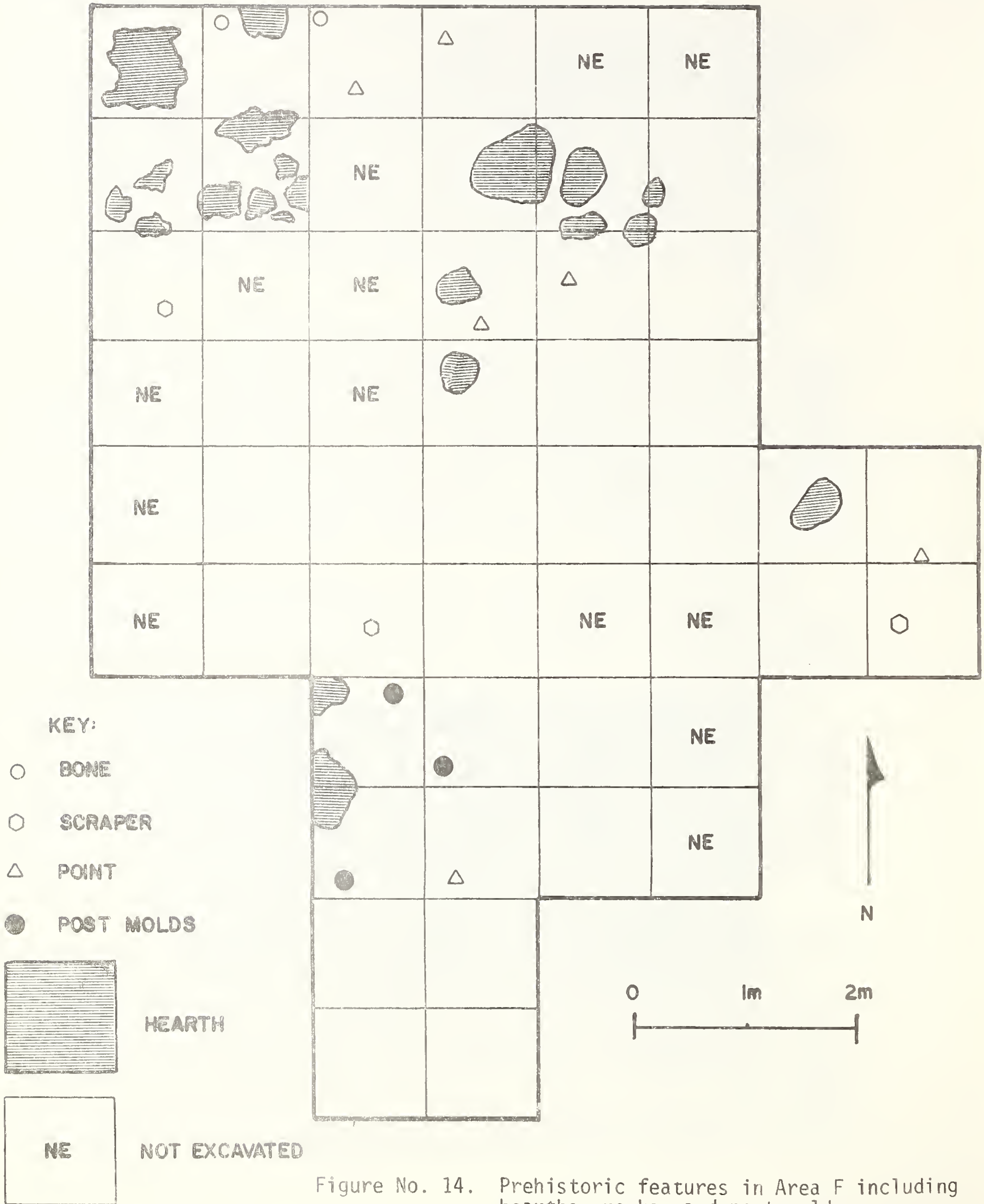


Figure No. 14. Prehistoric features in Area F including hearths, rocks, and post molds.

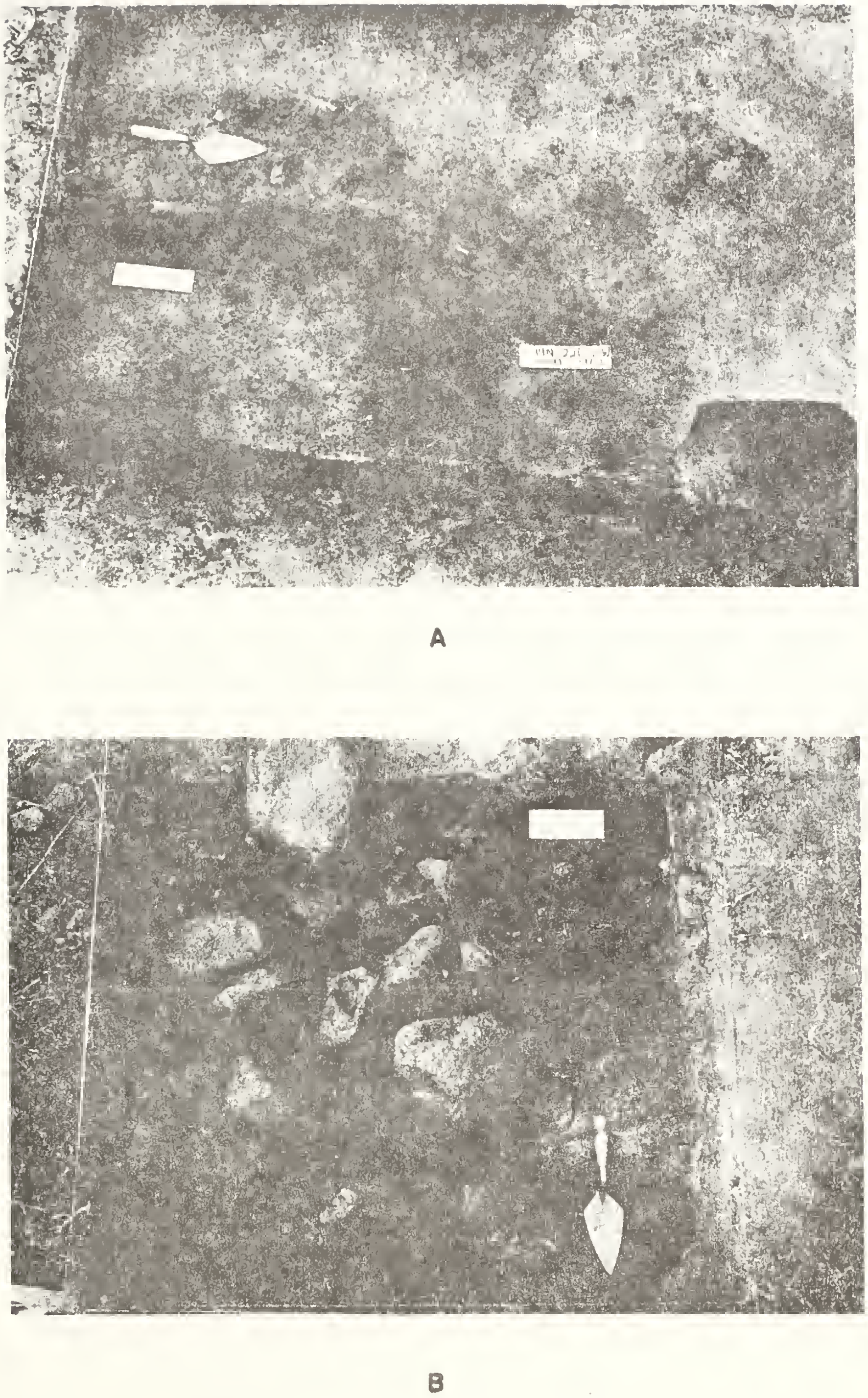
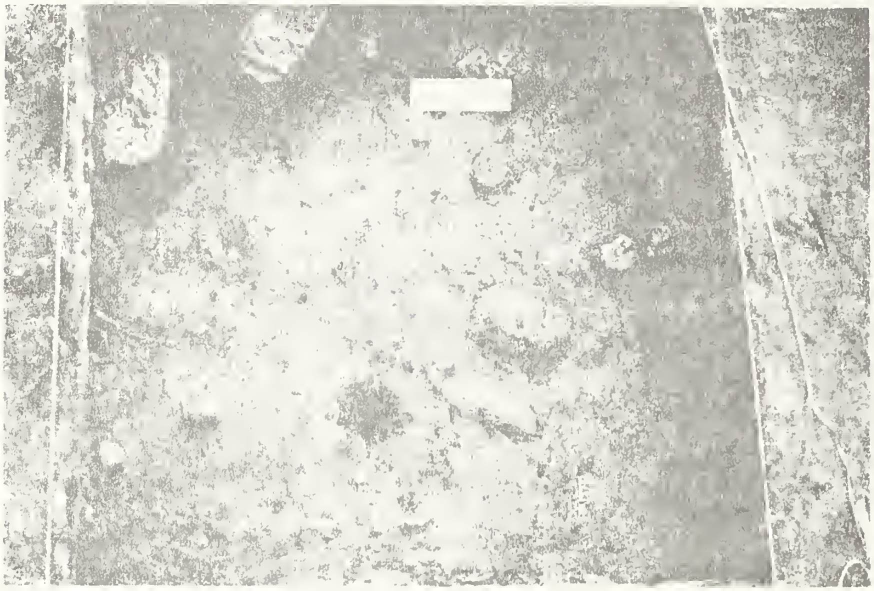
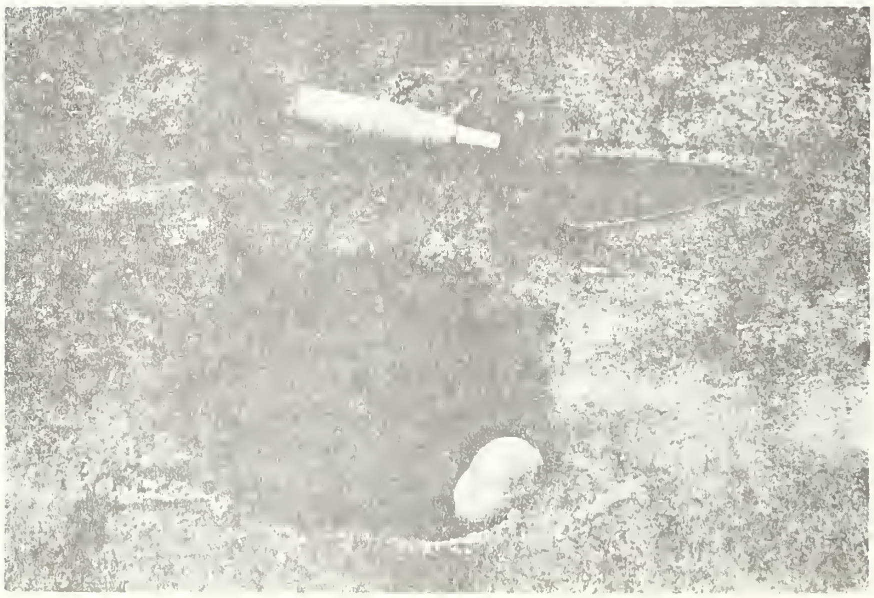


Figure 15. Prehistoric hearths/charcoal stains: Overlapping, unlined, saucer-shaped hearths, A; Diffuse charcoal stain, B.



A



B

Figure 16. Post mold features: View of one post mold feature in relation to associated living floor, A; cross-section of post mold feature showing how it tapers, B.

Evidence of the post molds was encountered between 14-20 cm. below the present surface and extended 8-12 cm. into the deposits. The placement and size of the post molds indicates a possible tripod drying rack. The fundtional interpretation of what these post molds represent remains conjectural, for various reasons. It is important to realize that one or more additional posts may have remained unexcavated in the grid to the west of this area.

FLORAL AND FAUNAL REMAINS

Flora

Floral remains from the West Rosebud Lake site include seeds, wood, and pollen. The seed remains are round, hollow pericarps of berries. Not enough remains of the seeds to make positive identification, but they are of the general size and characteristics of kinnickinnick berries (Arctostaphlas sp.) serviceberry (Amelarchier sp.), and huckleberry (Vaccinium sp). Each of these plants occurs within the general area and each was widely exploited by Native American groups. During the late summer berries were collected and dried, to be mixed with meat fat, and marrow to produce pemmican. Seed remains were concentrated in two locations of the site. The heaviest concentration was found in a single test unit excavated to the north of the main area of concentration (28N, 28E; see Fig. 4). This grid produced a moderate number of small, secondary flakes and one hearth feature was reported, as well. Other seed remains were recovered from the north-western portion of the site (14N, 22E) where the overlapping hearths were excavated (see Fig. 15a). The seeds were recovered from within and around the upper hearth feature, indicate a late prehistoric (?) affinity.

A single wood specimen from undisturbed deposits has been indentified a true fir (Abies sp.) which was locally widespread. Why this single piece of wood was preserved is unknown. Extremely small growth rings visible on this specimen indicate an arid climate for several years prior to cutting the tree limb. Unfortunately, the complex stratigraphy precludes assinging in the site (16N/28E, 30cm b.d.), it is most apt to be associated with a Late Plains Archaic occupation.

The only economically important pollen reported from the site (Appendix A) is Epilobium which includes several members of the Evening Primrose family. A single pollen sample from one location in Area F (12N/28E) produced a high proportion of Epilobium pollen. This sample came from intact cultural deposits which, based on associated projectile points, date to Late Plains Archaic times.

Both Evening Primrose and Fireweed have edible parts. The young shoots and greens of Firewood are edible (Harrington 1967, Kirk 1970) and can be eaten fresh or as potherbs. "The leaves, green or dry, make good tea" and "the pith of the stems is good in soups" (Kirk 1970:112).

Many parts of the Evening Primrose are edible. "The Indians dried the roots of Evening Primrose for winter use" and "also used the seed pods and the ripe seeds" (Williams 1977:38). The roots can also be "boiled like parsnips" (Harrington 1967:84). If the entire plant was collected when roots were gathered and if this occurred during the late summer when the flowers were in bloom, this would explain the presence of the high Epilobium pollen content in this particular area of the site.

Fauna

The faunal remains from West Rosebud Lake are extremely limited (Table XX). This is not surprising given the highly acidic soil which promotes rapid decomposition of bone. Most of the recovered bone fragments, which are splintered long bones, had been charred.

Within the northern part of Area F, several fragments of bone were recovered which represent parts of a large herbivore. Although these remains are too fragmented to discern whether they represent Bos or Bison, their context in the site would indicate that they represent Bison. A proximal bird humerus found in the same area appears to be about the size of a mallard duck--but speciation is not possible. A partial deer tibia found on the surface is probably modern.

TABLE XX. FAUNAL REMAINS FROM THE WEST ROSEBUD LAKE SITE.

DESCRIPTION	LOCATION	SPECIES
long bone shank fragment, crushed. Ca. 10cm long	16N/30E-NW 1/4 21cm below surface	Bos/Bison?
4 small fragments and one tooth enamel fragment	16N/30E-NE 1/4 15-25cm b.d.	large herbivore
proximal humerus	16N/30E NW 1/4 15cm b.d.	bird (?)
large quantities of tiny burned bone fragments	16N/28E NE 1/4 6-16cm b.d. and 20-30cm b.d.	(?)
3 burned bone fragments	16N/28E NW 1/4 16-20cm b.d.	(?)
fragmented 2nd phalange	14N/28E SW 1/4 11cm b.d.	Bos/Bison?
2 burned bone fragments	10N/30E-Bulk between NE & SE 1/4	(?)
unfused distal radius	18N/34E 10-20cm b.d.	Bos/Bison?
distal tibia	14N/20E NE 1/4 surface	Deer

STRATIGRAPHY and INTRA-SITE PATTERNING

Based on the chemical analyses and mechanical sorting of the sediments from the West Rosebud Lake Site, the stratigraphic sequence appears rather straightforward (Appendix C). The stratigraphic sequence indicates that much of the present surface material is recent fill which gets deeper to the north where it butts against a kame terrace. The recent fill material may be diverted sediments from placer mining activities which appear to have taken place upstream from the site. The southeastern portion of the site appears to have been buried from stream overflow rather than mining-diverted sediments.

The general stratigraphic sequence is as follows: The recent fill material (A1-B2) is resting on an organic A horizon (IIA1), followed by a truncated IIB zone, and a parent sand above the undulating basal fill. Unfortunately, the situation is more complex than this may appear. In limited areas of the site, two buried A horizons are visible. Details of the stratigraphy will be discussed and illustrated below in the context of vertical distribution of diagnostic artifacts.

Like most high-altitude sites, the West Rosebud Lake site deposits have been subjected to a wide variety of disturbing activities. Modern camping which has occurred within the last sixty years is the most noticeably disruptive activity. Associated with Forest Service campground maintenance work was the leveling of a large area along the western border of the site for a parking lot. As mentioned, stream action intensified erosion of the southeast portion of the site. Tree growth, tree fall, forest fires, frost action, and rodent activity have also been disruptive factors.

Despite the significant number of natural and cultural agents which have influenced and disrupted the site stratigraphy, the IIA1 horizon is a generally intact paleosol which was stable for several hundred to several thousand years and has not significantly eroded.

Reliable stratigraphic details are available for the units excavated in 1979. For Area F, in general, there is a fairly continuous, undulating, culture-bearing stratum which extends throughout the central portion of the area. Diagnostic projectile points which occur in this stratum are limited to corner-notched forms (Fig. 17). In addition to this Late Archaic stratum, peripheral portions of Area F display variable stratigraphy. In the western part of the area, the Late Archaic stratum disappears and an upper stratum appears which produced a Late Prehistoric projectile point base (Fig. 18A). In the northern part of Area F, two culture-bearing strata, separated by a sterile stratum, are observable. The upper component produced a corner-removed point and the lower component produced a large side-notched point (Fig. 18B). On the west side of Area C, two culture-bearing strata are present as is apparent in the photograph of the overlapping hearth features (see Fig. 15).

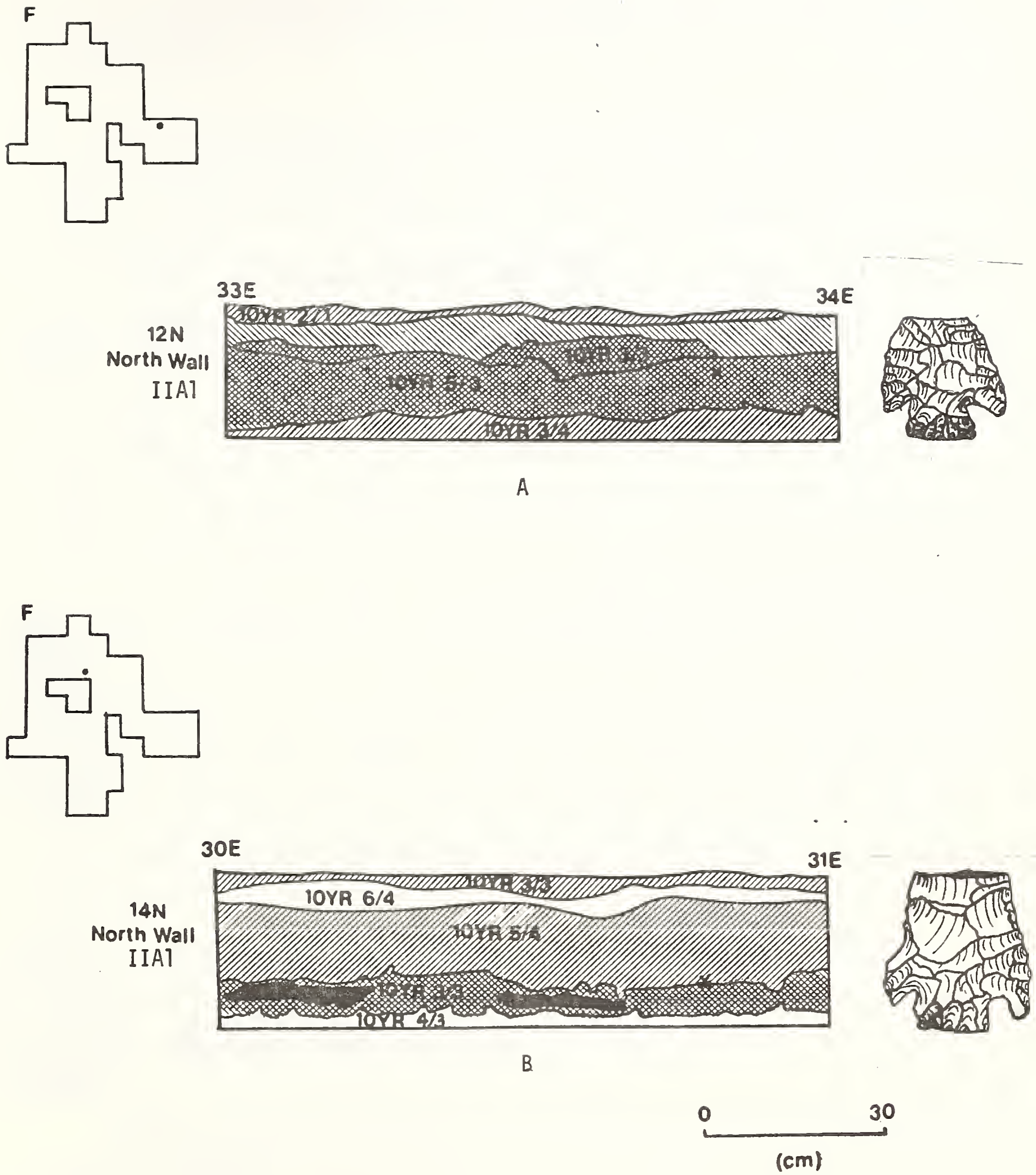


Figure 17. Stratigraphic profile showing the position of Corner-Notched projectile points within the deposits. The noted LLA1 horizon is apparent in all but limited, peripheral areas of the site.

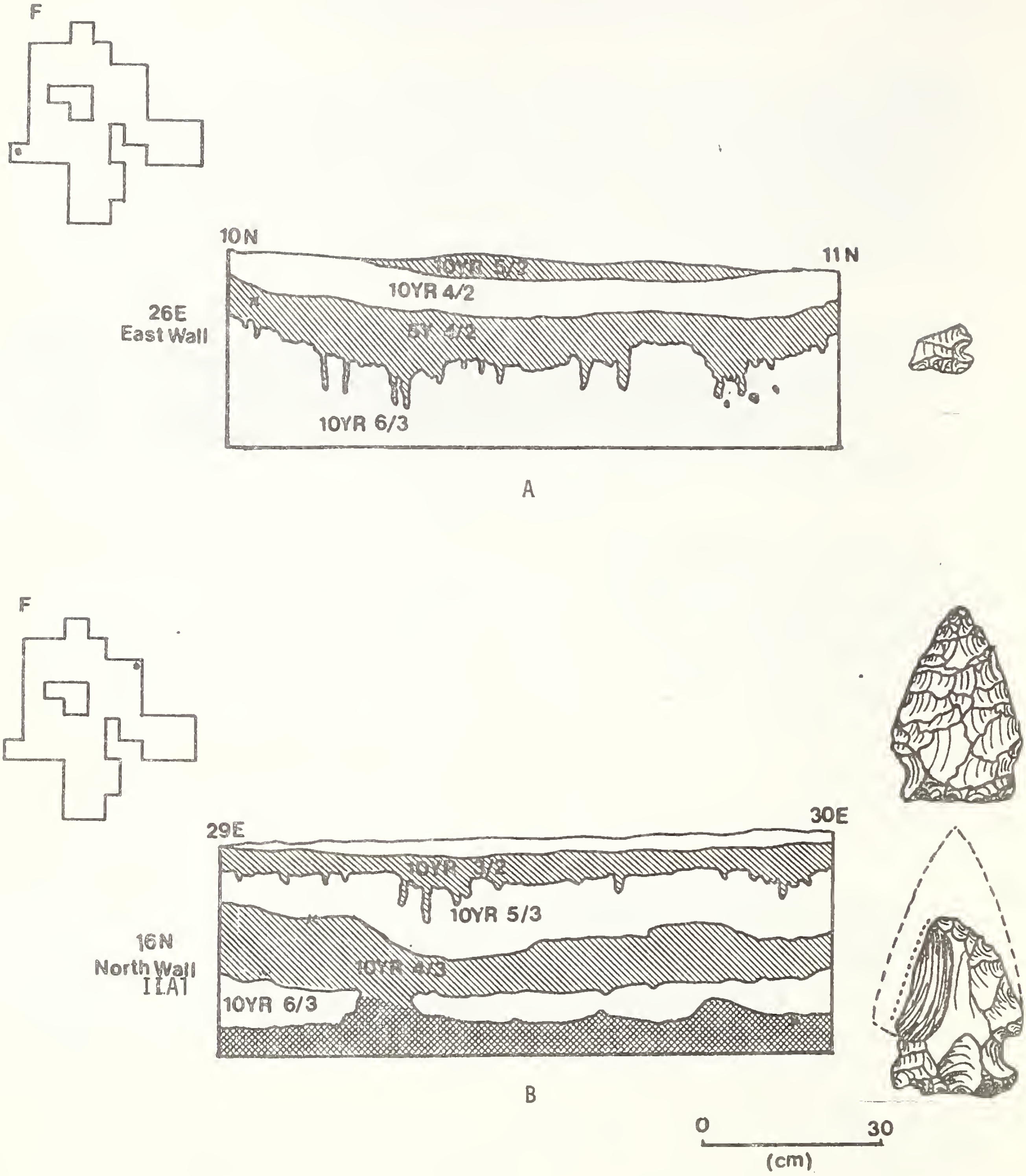


Figure 18. Stratigraphic profile showing the position of a Late Prehistoric Side-Notched projectile points (A) and Corner-Removed and Early Side-Notched projectile points (B) within the deposits in peripheral site areas.

These stratigraphic data indicate that multiple occupations occurred at the site but did not necessarily overlap one another. If this is the case, horizontal patterning may be apparent which may help to isolate discrete occupation areas.

In an attempt to examine the possibility of differential use of materials by the various groups who occupied the site, horizontal distributions of lithic materials are considered. Although the excavation area units are somewhat arbitrary, nonetheless, the disparity among debitage material ratios from one unit to the next demonstrates the variable distribution of materials across the site (Table XXI). Nearly all of the Tongue River Silicified Sediment occurs in Area D and the northern portion of Area F, in the northeastern part of the site. Obsidian is most highly represented in the southern portion of Area F, moderately represented throughout the central portion of the site, and comprises less than 10% of Areas A and D.

It must be cautioned that over 90% of the obsidian debitage flakes from Area F are less than one centimeter in length and were retrieved through fine-mesh screening. Because of the absence of fine-mesh screening of materials throughout the rest of the site, the high number is somewhat misleading. However, the number of flakes greater than one centimeter in length is also highest in Area F, supporting the conclusion that obsidian is most highly represented in Area F.

Specific types of cherts, jaspers, and agates occur in varying proportions throughout the site. Some of these materials occur in tight clusters which appear to represent tool manufacturing locales.

Within Area F of the 1979 excavations, individual patterning is readily observable (Fig. 19). Several of the clusters are composed of resharpening flakes of a particular material. Apparently each cluster is representative of a tool resharpening location. Most of the tools being resharpened were bifaces, presumably projectile points and knives. Other clusters of particular lithic materials are comprised of secondary manufacturing debris. Beyond individual tool manufacturing activities, the clustering of lithic materials may indicate that a number of different occupations are represented within the overall site area.

A look at the distribution of tools throughout the site enhances our understanding of represented activities but fails to clarify the boundaries of the multiple prehistoric occupations. The distribution of tools generally parallels that of flake concentrations. When clusters of particular lithic materials appear to be associated with diagnostic artifacts, we are able to generally delimit individual areas of occupation.

In Area A, where a single flake concentration is centralized, the tools are somewhat more widely distributed (Fig. 20 Table XXII). Area A contains 12 scraping tools (2 intentionally modified, 10 impromptu flake tools), 2 biface blanks and 1 biface preform, and 5 projectile points, including fragments.* Three cultural periods are represented by the projectile points.

*Due to the lack of in situ recovery in Areas A-E, the placement of artifacts within each grid is arbitrary. Nonetheless, viewing the general distribution of these tools is helpful in reconstructing activity areas.

TABLE XXI. HORIZONTAL DISTRIBUTION OF LITHIC TYPES, BY AREA.

		AREAS					
		A	B	C	D	E	F
	(sample)	(299)	(117)	(328)	(282)	too small	(1347)
1a-b	Obsidian/Ignimbrite	3%*	19%	17%	8%	--	40%
2a	Grey Chert	4%	--	6%	1%	--	12%
2b	Black Chert	--	--	1%	3%	--	1%
2c	White Chert	17%	8%	2%	12%	--	3%
2d-e	Lavendar-Pink Chert	6%	6%	1%	--	--	2%
3i-j	Tan Jasper	--	--	1%	--	--	1%
3b	Red/Purple Jasper	2%	19%	18%	1%		2%
3c	Dark Red Jasper	10%	13%	20%	9%	--	5%
3d	Orange-red Jasper, opaque	46%	--	6%	2%	--	7%
3e	" " " , translucent	--	5%	3%	10%	--	5%
4a	Dark brown agate	--	--	4%	4%	--	1%
4b-c	Banded, mottled agates	1%	3%	6%	13%	--	2%
4d-e	Red mottled chalcedony	--	--	1%	2%	--	3%
5	Quartzite	--	--	1%	--	--	6%
6	TRSS	6%	24%	11%	34%	--	9%

* = percentage of represented materials.

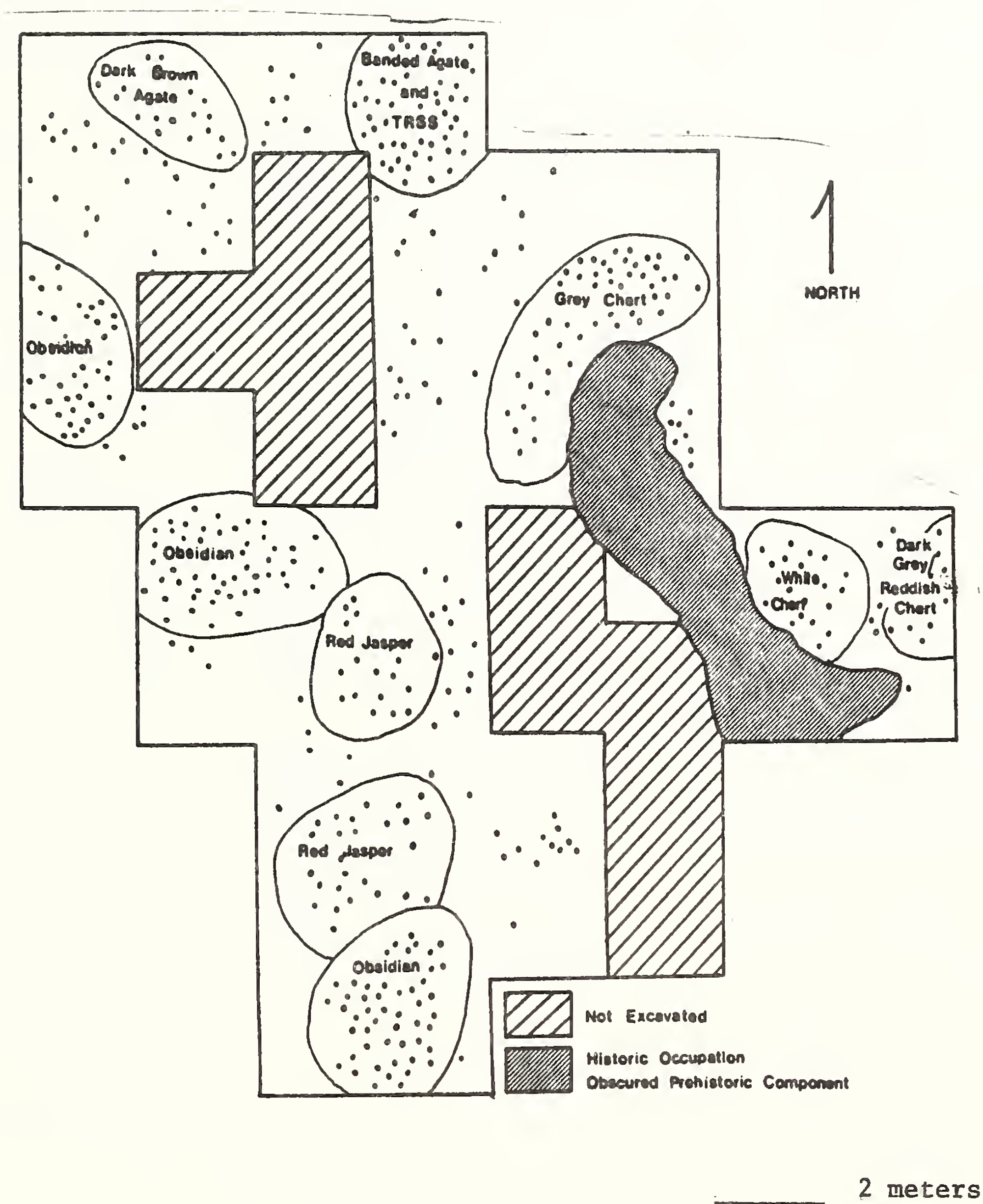


Figure 19. Lithic material clusters in Area F.

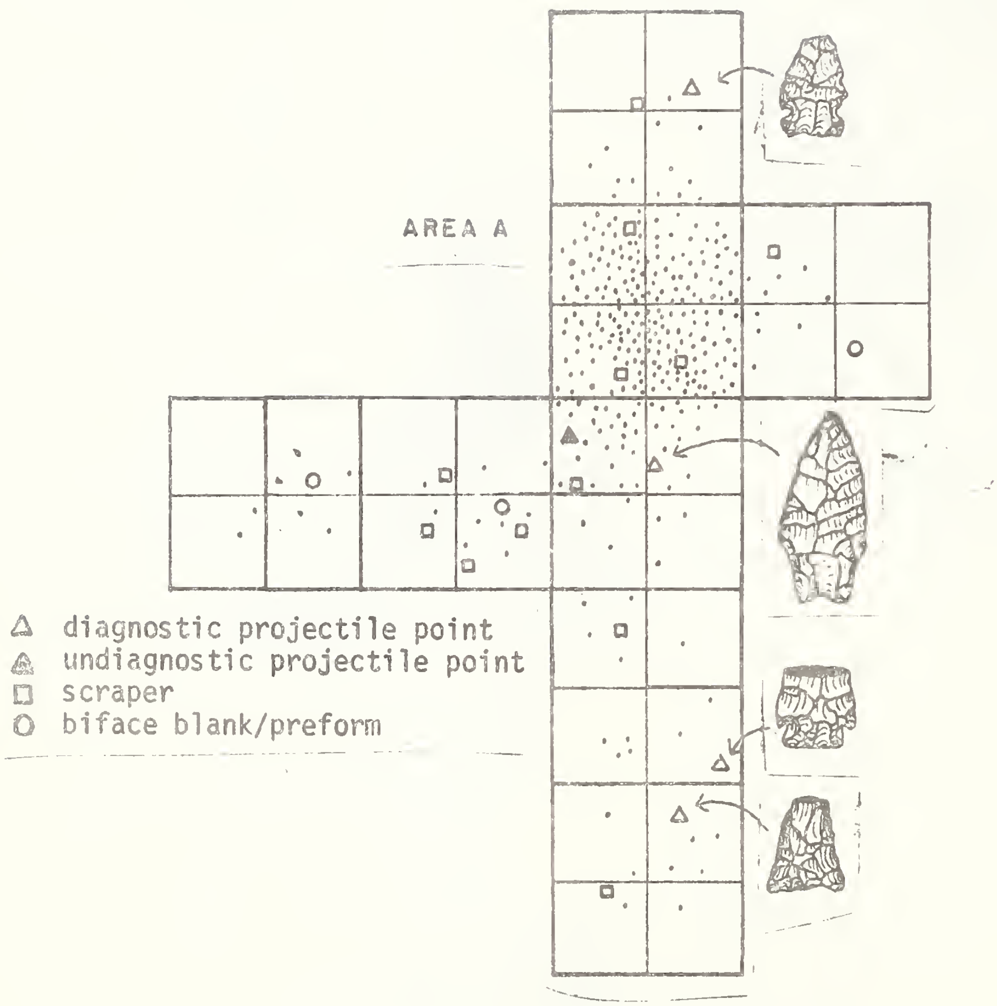


Figure 20. Distribution of tools and flakes in Area A.

TABLE XXII. LITHIC TOOLS FROM AREA A.

#	Location	Condition	Dimensions L/	W/	T/	Material Type	Morphological-Use Form
78/2	16S/2W	F	40	--	8.5	3i	Biface blank fragment
78/6	12S/4E	F	--	--	2	8	Utilized flake
78/7	12S/4E	C	24	14.5	3	3e	Side-noticed projectile point
78/8	14S/4E	F	--	--	6	3j	End scraper
78/9	20S/4E	F	--	17	5.5	1a	corner-notched projectile point midsection
78/12	14S/6E	C	45	20.5	3	2b	Utilized flake side-scraper
78/16	22S/4E	F	--	16	4	1a	Utilized flake
78/18	16S/4E	C	41	18	4	5a	McKean projectile point
78/22	16S/2E	F	--	28	6	4d	Biface blank fragment
78/25	16S/2E	F	--	44	6	7c	Side scraper
78/27	18S/4E	F	--	--	3.5	4a	Modified flake fragment
78/29	18S/4E	F	--	17	3.5	3f	corner-notched projectile point base
78/86	14S/6E	F	--	30	9	2d	Biface preform fragment
78/87	14S/4E	F	--	35	5	2c	Utilized flake side scraper
78/88	14S/4E	F	--	20	6	3i	Utilized flake side scraper
78/89	16S/2E	F	--	--	6	6	Modified flake side scraper
78/90	16S/2E	C	22.5	12	2	3a	Utilized flake side scraper
78/91	16S 2E	F	--	23	4	2b	Utilized flake side scraper
78/92	16S/4E	C	35	22	6.5	2b	Utilized flake
78/93	16S/4E	F	--	12	3.5	3b	Projectile point tip

In the northern part of the area, a Late Prehistoric side-notched point was recovered. The two McKean Complex points (1 complete, 1 tip) were found in the center of the area, in the same grid. Two corner-notched points of the Late Plains Archaic period were located in the southern part of the area. Based on this information, it appears that Area A contains remnants of at least three separate occupations.

Little can be said concerning activities associated with the Late Plains Archaic and Late Prehistoric occupations in Area A. The dearth of material from these occupations is attributed to erosion. However, several activities can be discerned from the materials associated with the McKean projectile points. Ten scraping tools were situated within a 16 square meter area which also contained the McKean complex projectile points. As mentioned in the discussion concerning use-wear patterns on scraping tools, most of the tools seem to have been used for scraping some resilient material such as wood or bone. A number of impromptu flake scrapers are represented, although they were not used to a great extent. They apparently lost their edges quickly, were discarded, and were easily replaced by other flake scrapers.

The biface blanks and preforms in addition to the substantial quantity of debitage, attest to manufacturing activities. A high percentage of the material in this part of the site is an opaque, orange and white mottled jasper. No flintknapping tools were recovered.

Area B offers little information concerning the period(s) of occupation (Fig. 21, TableXXIII). The lithic material composition, with a high percentage of obsidian and dark red jasper, make this area most similar to Area F which contains a large number of corner-notched projectile points.

The corner-notched basal fragment from Area B supports this association.

Represented activities include scraping some type of resilient material (12 scrapers) and flintknapping (4 biface blanks and debitage). More than half of the scrapers are intentionally modified, formal tools. These display more intensive use-wear than the impromptu flake scrapers and appear to have been used for more demanding, heavy-duty scraping tasks.

Area C contains projectile points from the Middle Plains Archaic, Late Plains Archaic, and Late Prehistoric Periods (Fig. 22, Table XXIV). These points display some degree of horizontal separation. The lack of precise stratigraphic control in excavation precludes our ability to determine vertical separation.

Lithic material distribution indicates differential patterning. In the northwest corner of the area which contains the two small, stemmed projectile points, Tongue River Silicified Sediment (TRSS) is prevalent. This material is also associated with Late Prehistoric Points in Area D. Red jasper and various agates are distributed in the northeast corner in the vicinity of a corner-notched point. Other patterns are less clear.

Because of a lack of distinctive breaks between diagnostic tools, it is difficult to ascertain which tools and debitage are associated with specific occupations. In general, both scraping and biface reduction activities were carried out.

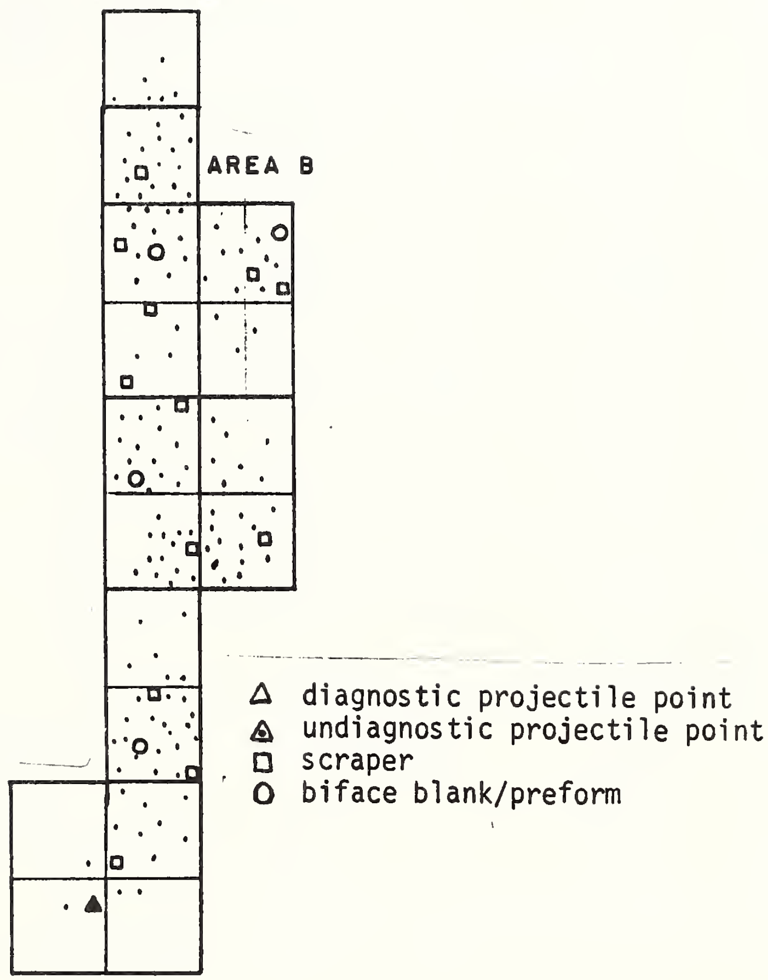


Figure 21. Distribution of tools and flakes in Area B.

TABLE XXIII. LITHIC TOOLS FROM AREA B.

#	Location	Condition	Dimensions L/	W/	T/	Material Type	Morphological-Use Form
78/3	2N/14E	F	--	18	5.5	4b	End/side scraper
78/4	2N/14E	F	--	--	2	6	corner-notched proj. pt. base
78/10	10/14E	F	--	--	7	3i	Side scraper
78/13	8N/14E	F	--	--	--	3i	Projectile pt. preform
78/14	8N/14E	C	79	31	13	2e	Side scraper
78/15	8N/14E	F	--	17	3.5	3e	End scraper
78/17	6N/14E	C	48	35	7.5	4b	Side scraper
78/19	6N/14E	F	--	32	10	2d	End/side scraper
78/21	6N/14E	F	--	30	5	2d	Biface preform fragment
78/24	4N/14E	F	--	10	3.5	1a	Small spokeshave
78/26	4N/14E	F	--	20.5	6	3i	End scraper
78/28	8N/15E	F	--	--	3.5	2c	Spokeshave fragment
78/32	8N/15E	F	--	--	7	1b	Biface preform fragment
78/58	4N/14E	C	30	20.5	5	2d	Biface preform fragment
78/59	6N/14E	F	--	--	3	2a	Utilized flake fragment
78/60	6N/15E	C	23	26	3.5	1a	Utilized flake
78/61	8N/15E	F	--	--	7	7a	Utilized flake fragment

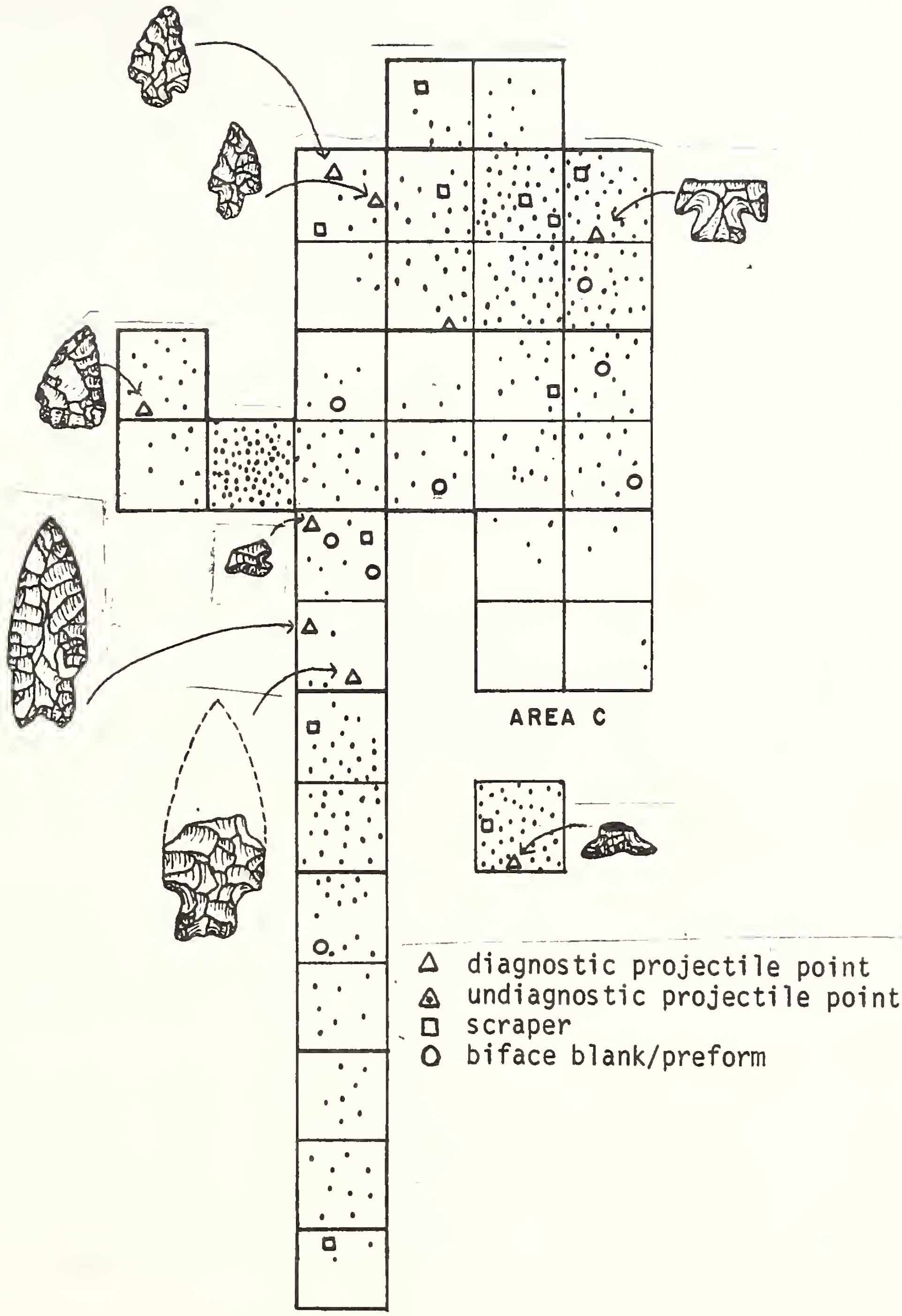


Figure 22. Distribution of tools and flakes in Area C.

TABLE XXIV. LITHIC TOOLS FROM AREA C.

#	Location	Condition	Dimensions L/	W/	T/	Material Type	Morphological-Use Form
78/5	14N/23E	F	--	--	4	1a	Biface preform fragment(edge)
78/11	12N/22E	F	--	--	13	1a	Biface blank fragment
78/20	10N/22E	C	23	19	4	3f	Side scraper
78/23	8N/22E	C	33	20	5	1a	Biface preform
78/30	12N/23E	C	44	27	11	3j	Biface preform
78/31	12N/22E	C	45	17	6	3j	Duncan-Hanna point
78/33	12N/22E	F	--	23	6.5	1b	Duncan-Hanna point base
78/35	14N/25E	F	--	--	3	1a	Biface preform fragment
78/38	16N/23E	C	22	13	2	5c	Small stemmed point
78/39	16N/23E	C	23	15	4	1a	corner-removed proj. pt.
78/40	16N/23E	C	21	12	3	3j	small stemmed point
78/44	16N/25E	F	--	19	4	2d	corner-noticed pt. base
78/48	18N/23E	C	22	17	5	3f	End/side scraper
78/63	12N/22E	C	13.5	22	3	1a	Utilized flake
78/64	12N/22E	F	--	--	5	1a	proj. pt. basal fragment
78/65	12N/25E	F	--	13	2.5	1b	Projectile point preform
78/66	14N/23E	F	--	--	2.5	1b	Proj. pt. preform fragment
78/67	16N/25E	F	--	17	4	2d	Biface midsection
78/68	16N/25E	F	--	27	3	3C*	Utilized flake scrap. tool
78/69	14/25E	F	--	--	7	2d	End scraper fragment
78/70	14N/25E	F	--	--	6	7a	Biface midsection fragment
78/74	16N/23E	C	18	27	5	5e	Utilized flake scrap. tool
78/75	16N/25E	F	--	--	9	3c	modified flake scrap. tool
78/76	16N/25E	C	20	29	10	3g	modified flake
78/95	4N/22E	C	31	17	4	4a*	Side scraper
79/194	10N/24E	F	--	12	2	3c	Use-modified flake scraper
79/204	10N/24E	F	--	16	2.5	2b	side-notched proj. pt. base
79/87	14N/20E	F	--	--	3	7a	side-notched proj. pt. basal fragment

*heat spalled

Areas D and E contain a complex mixture of occupations including Early Plains Archaic, Late Plains Archaic, and Late Prehistoric components (Fig. 23, Table XXV). Generally speaking, the northern portion of the area contains the Late Plains Archaic remains and the southern portion contains the Late Prehistoric. The single identifiable Early Plains Archaic artifact is situated on the eastern periphery of Area D.

Analysis of the lithic material distribution does little to clarify the issue. Dark red jasper follows approximately the same distribution as corner-notched, Late Plains Archaic projectile points. Tongue River Silicified Sediment is prevalent in the southeast corner of Area D. This appears to be associated with Late Prehistoric remains, as it was in Area C. Also found in this area was black chert and a distinctive grey chert with white, circular inclusions. Area E contained predominantly pink and lavendar chert and red jasper in association with Late Prehistoric projectile points.

Again, represented activities include lithic manufacturing as evidenced by 6 biface blanks and preforms, debitage, and a core of Tongue River Silicified Sediment. This was the only core found at the site. Also represented are scraping activities, evidenced by 12 scrapers, most of which were impromptu tools. Additional tools found were a knife fragment and a large flake chopper.

The majority of diagnostic projectile points from Area F are corner-notched forms which possibly represent more than one occupation occurring during the Late Plains Archaic and early Late Prehistoric periods (Fig. 24, Table XXVI). One large side-notched point, believed to date from the Early Plains Archaic, was recovered from the northern periphery of this area. (Tests to the north of this area proved unsuccessful due to previous subsurface disturbance.)

There is definite patterning in the lithic material distribution to support the contention that at least 2 components are represented in this area. Whereas obsidian and red jasper are prevalent throughout most of the area, these materials are absent from the northern periphery where the large side-notched point occurred. In this location, Tongue River Silicified Sediment (TRSS) was abundant, especially in the deeper deposits.

Activities represented in Area F essentially parallel those of the other areas: scraping and flintknapping. However, fewer biface blanks and preforms were recovered per square meter than in other areas and the debitage tended to be of a smaller size. Based on this evidence, it appears that tool resharpening was more common in this area than tool manufacture. The exception is in the northern portion where the Tongue River Silicified Sediment flakes are of greater size and appear to represent secondary tool manufacture.

Scraping activities are also represented. Of the 10 scrapers recovered, all were impromptu flake tools and 2 of these were spokeshaves (concave-edge scrapers). Spokeshaves are useful for whittling bone or wood.

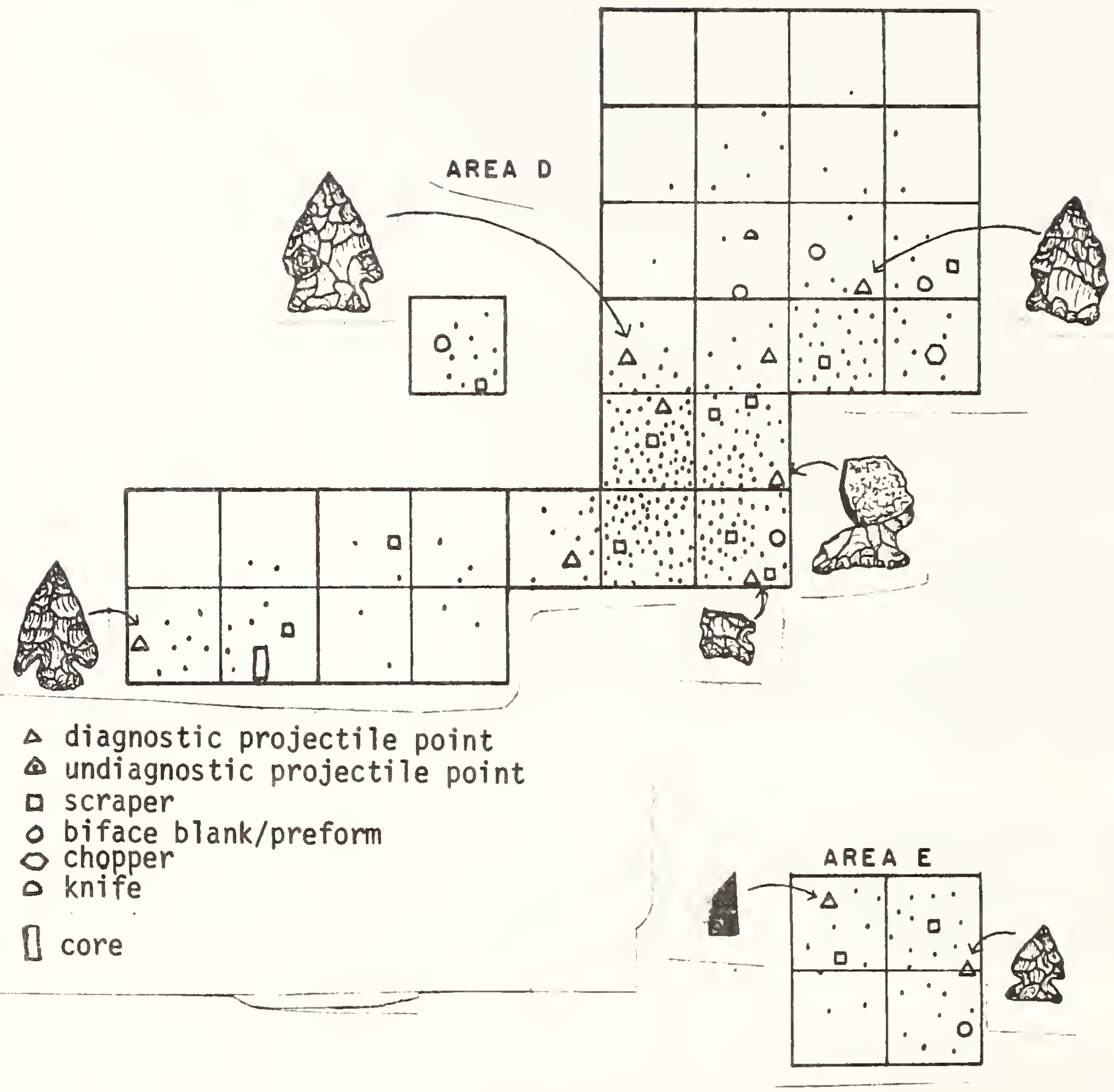


Figure 23. Distribution of tools and flakes in Areas D and E.

TABLE XXV. LITHIC TOOLS FROM AREAS D AND E.

#	Location	Condition	Dimensions L/	W/	T/	Material Type	Morphological-Use Form
Area D							
78/41	21N/41E	C	55	32	9	2e	end/side scraper
78/42	21N/41E	F	--	--	7	3a	biface W/steep scrap. edge
78/43	21N/41E	F	--	--	8	3j	biface blank
78/45	21N/41E	C	27	17	4	1a	corner-removed proj. pt.
78/46	21N/41E	C	110	57	25	5b	flake chopper
78/47	21N/39E	F	--	--	7	7b	biface midsection fragment
78/49	19N/39E	F	--	--	7	3i	end scraper fragment
78/50	19N/39E	F	--	--	--	3h	biface edge fragment
78/51	19N/39E	F	--	--	3	3d	projectile point tip
78/53	19/39E	C	27	26	8	4a*	end scraper
78/54	21N/39E	C	27	23	5	4d*	corner-notched proj. pt.
78/55	19N/39E	C	38	14	3	4e	utilized flake scraper
78/56	18N/34E	C	26	18	3	1a	corner-noticed proj. pt.
78/77	18N/36E	F	22	18	2	1a	utilized flake
78/78	18N/37E	F	--	11	3	3d	projectile pt. midsection
78/79	19N/39E	C	28	21	6	3h	utilized flake scraper
78/80	19N/39E	F	--	--	--	3e*	end scraper remnant
78/81	21N/39E	F	--	--	9	5d	biface tip-cutting tool
78/82	21N/39E	F	--	--	5	3g*	proj. pt. midsection frag.
78/83	21N/41E	F	--	23	5	3a	unfinished prj. pt. base
78/84	18N/34E	C	19	18	3.5	1a	utilized flake
78/94	18N/34E	C	70	48	20	7c	chopper
78/96	19N/39E	F	--	--	5	2c*	large side-notched proj. point base

*heat spalled

TABLE XXV. LITHIC TOOLS FROM AREAS D AND E (continued)

#	Location	Condition	Dimensions L/	W/	T/	Material Type	Morphological-Use Form
78/97	19N/39E	F	--	13	2.5	3d	small side-notched proj. point base
78/98	19N/39E	C	26	24	4	1a	utilized flake
Area E							
78/36	14N/41E	F	--	33	7	3j	multi-purpose scraping/ cutting tool
78/37	14N/41E	C	16	11	3	3h	side-notched proj. pt.
78/71	14N/41E	F	--	--	2	3c	triangular proj. point base fragment
78/72	14N/41E	F	--	--	4	2b	utilized flake scraper
78/73	14N/41E	F	--	--	2.5	3a	biface preform fragment

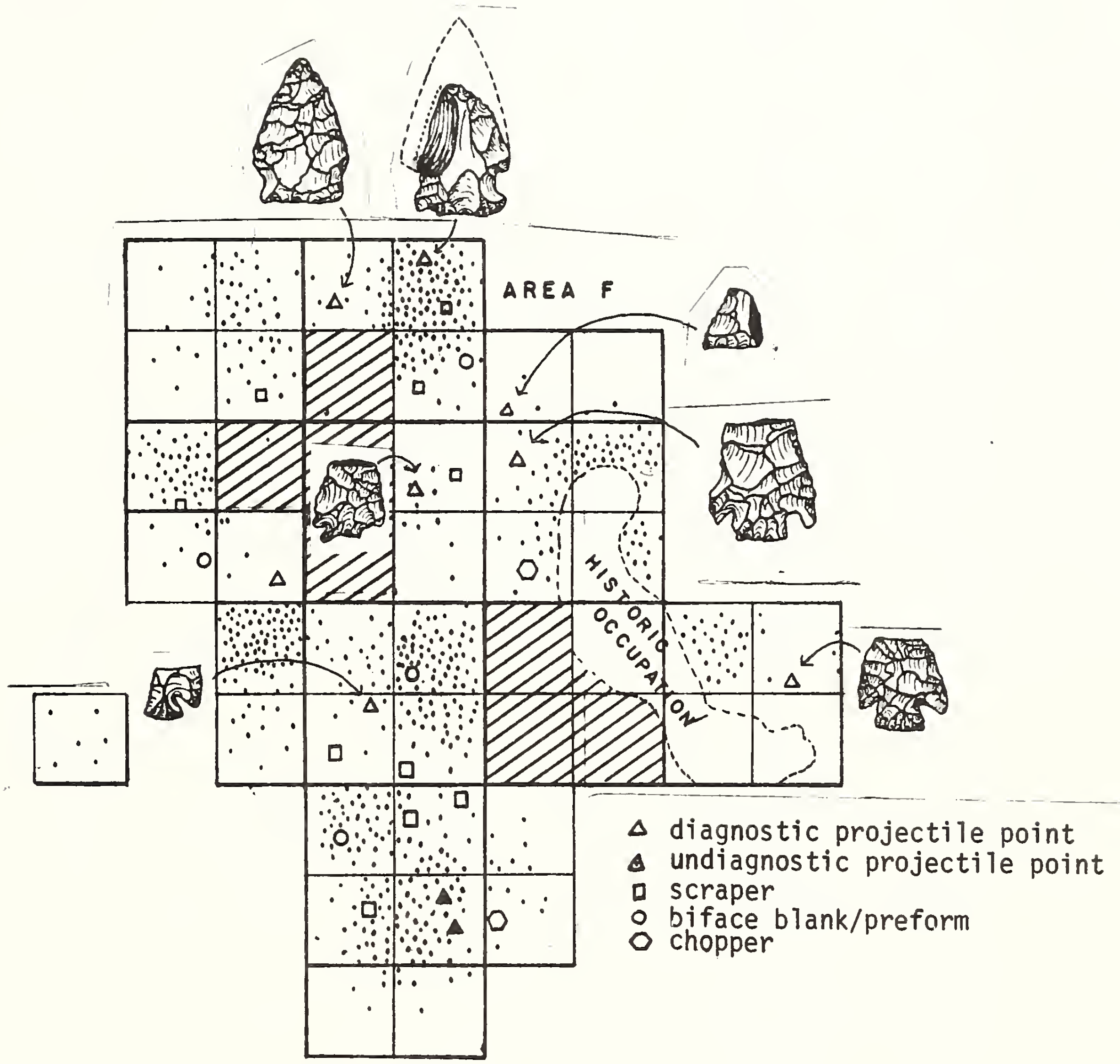


Figure 24. Distribution of tools and flakes in Area F.

TABLE XXVI. LITHIC TOOLS FROM AREA F.

#	Location	Condition	L/	W/	T/	Material Type	Morphological-Use Form
79/15	10N/30E	C	24	16	4	1a	utilized flake
79/16	10N/30E	F	--	--	--	1a	proj. pt. tip fragment
79/18	10N/30E	F	--	--	--	1a	proj. pt. edge "
79/24	10N/30E	F	--	29	10	3*	biface blank fragment
79/25	10N/30	C	15	28	4.5	5c	utilized flake
79/51	12N/30E	C	28	27	6	4a*	end/side scraper
79/56	12N/30E	C	21	14	3	3d	utilized flake
79/65	12N/34E	F	--	20	4	1a	corner-notched proj.pt.base
79/90	14N/28E	C	39	28	9	3b	end/side scraper
79/100	14N/28E	F	--	--	--	3j	utilized flake edge frag.
79/104	14N/30E	F	--	16	4	1a	corner-notched proj.pt.base
79/106	14N/30E	F	--	27	9	3f	scraper fragment
79/109	14N/32E	F	--	24	6	2c	corner-notched proj. pt.
79/119	16N/28E	C	22	17	8	1a	utilized flake
79/131	16N/30E	F	--	21	5	2c	large side-notched proj.pt.
79/132	16N/30E	F	--	36	12	3a	biface blank fragment
79/170	16N/30E	C	31	21	5	4a	corner-removed proj. pt.
79/172	16N/30E	C	36	33	10	46	end/side scraper
79/173	16N/30E	C	31	16	2.5	3j	flake spokeshave
79/175	16N/32E	F	--	--	4	1a	corner-notched proj.pt. frag.
79/192	14N/28E	F	--	--	--	1a	proj. pt. edge fragment
79/193	12N/30E	F	--	--	3.5	1a	corner-notched proj.pt. frag.
79/195	10N/30E	C	23	16	4	2a	spokeshave
79/196	10N/32E	F	--	65	21	7d	biface chopper
79/197	12N/30E	C	38	25	10	2e	biface preform

*heat spalled

Two chopping tools were also recovered from Area F. The purpose of these tools is unknown. Chopping tools serve a variety of functions and are especially handy for cracking and mashing bone.

HISTORIC OCCUPATION

Two features were observed at the West Rosebud Lake Site which represent historic use of the area. To the south of the main site area, a series of cobble ridges parallel the creek. The cobble ridges are reminiscent of placer mining activities where cobbles were removed from the creek so that finer sediments could be run through a sluice. Documentation of placer mining in the Beartooths is lacking and no mining claim was filed for this area of West Rosebud Creek. Nonetheless, these cobble ridges appear as evidence that placer mining or some similar activity occurred along the creek.

In the eastern portion of Area F, we encountered an unusual arrangement of cobbles and boulders in association with a disturbed band of soil (Figure 20). A number of historic artifacts including a Prince Albert tobacco can, a broken bottle, a spoon, wire, round nails, sawn bones, and the "wick-holder" of a kerosene lamp were found within the area of disturbed soil.

Although conjectural, based on the shape and composition of the disturbed soil area, it appears that this may have been a trench. Considering the arrangement of the cobbles and boulders in relation to the "trench," it appears that the stones may have anchored the sides of a square or rectangular tent. When the tent was dismantled, the stones rolled into the trench. The trench would have served as a drain to keep water out of the living space. Two posts were discovered which appear to have served as corner supports (Figure 22).

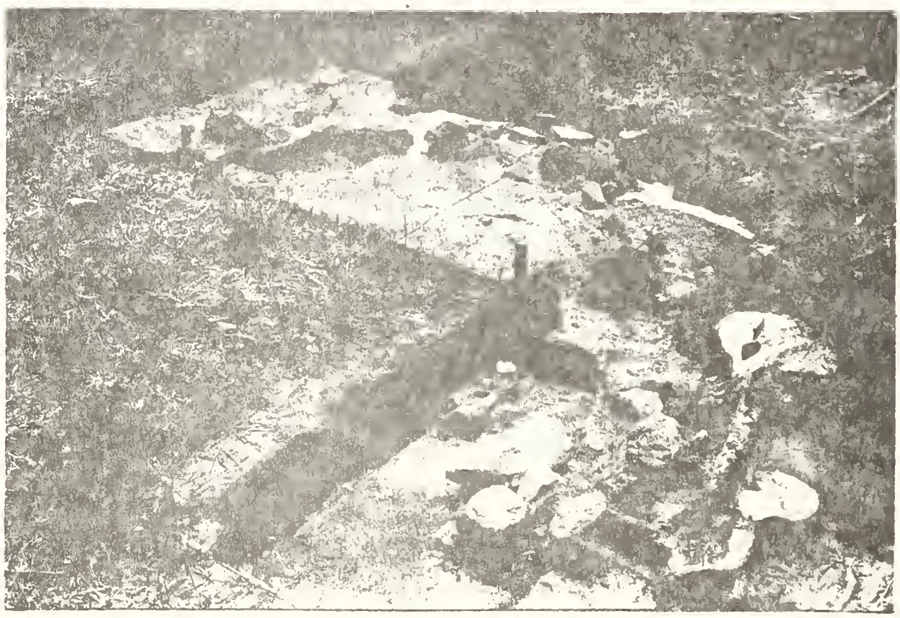


Figure 25. Photograph of historic cobble feature, Area F.

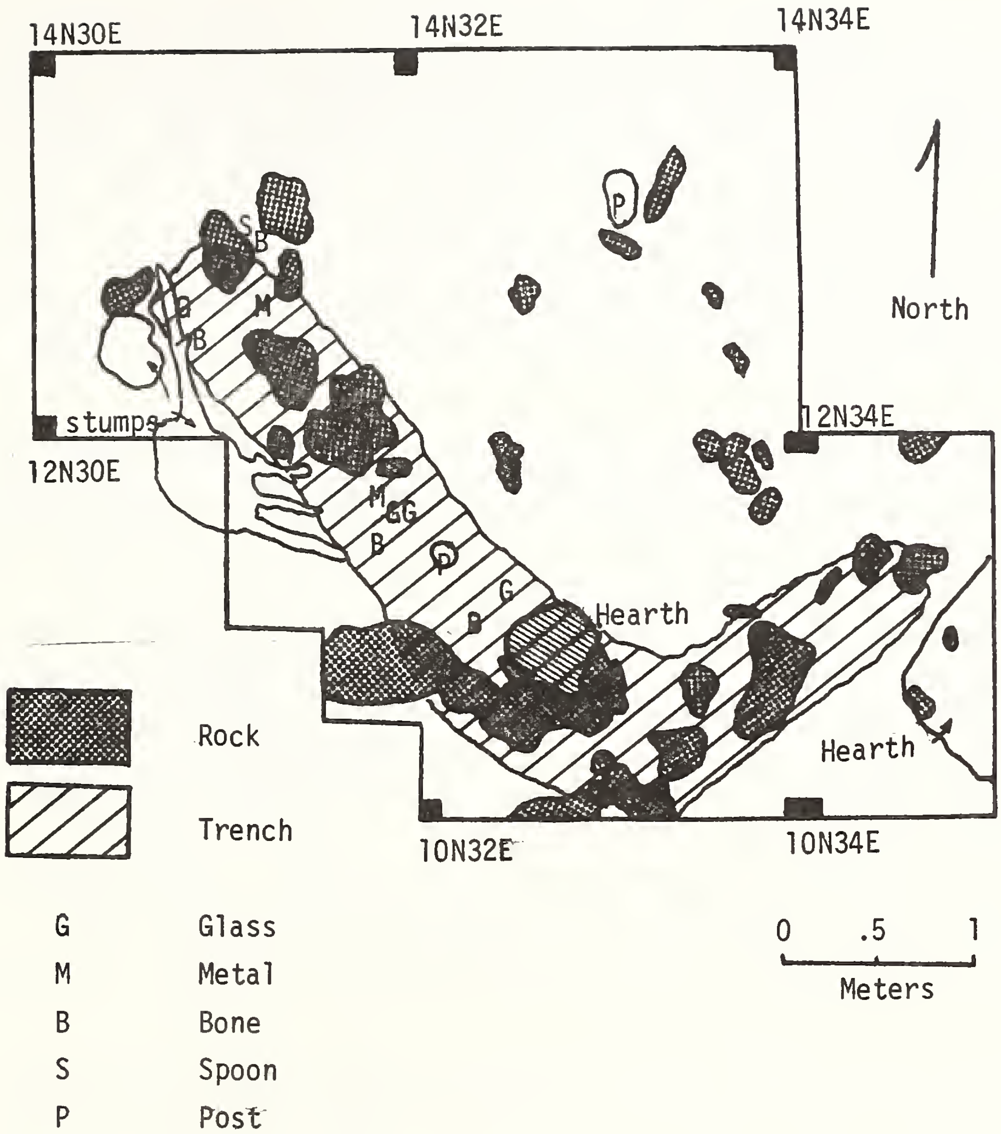


Figure 26. Illustration of historic cobble feature, Area F.

It is not surprising that no historical documentation could be found for this occupation. Based on the amount of trash and the nature of the lodging, it is likely that the duration of occupation was brief. Establishing a date for the occupation is difficult. The bottle neck indicates a date between 1910-1920. It is possible that the occupation was associated with the construction of the transmission line or it may represent early recreational camping. Unfortunately, because of the paucity of evidence, the purpose of this occupation will have to remain conjectural.

SUMMARY AND CONCLUSIONS

The accumulated evidence from the West Rosebud Lake Site indicates that the site was occupied a number of times over the last 6,000 years. Projectile points include large side-notched, lanceolate and stemmed-lanceolate, corner-notched, corner-removed, small side-notched, and small stemmed varieties. Typologically, they date to the Early, Middle, and Late Plains Archaic, and Late Prehistoric periods, respectively. Obsidian hydration data for a number of corner-notched and corner-removed points support the classification of these points as Late Plains Archaic. Unfortunately, obsidian was almost entirely confined to the Late Plains Archaic assemblage so that corroborative data are not available for the other cultural periods.

Horizontal distributional information is more informative than vertical, stratigraphic data. There is a single, intact, buried paleosol throughout the site, and additional buried soil remnants exist in limited areas. The Late Plains Archaic and more recent materials are associated with the extensive paleosol.

Lithic material distributional patterns are indicative of a number of campsite locations. The most obvious pattern is the negative correlation between obsidian and Tongue River Silicified Sediment. The obsidian is associated with the Late Plains Archaic occupations and the Tongue River Silicified Sediment appears to be associated with Late Prehistoric and possibly Early Plains Archaic occupations. Given that obsidian is available to the south of the Beartooths and Tongue River Silicified Sediment is available to the east, different territorial patterns may be reflected by this differential use of lithic materials. Beyond this rather gross lithic patterning, it is difficult to determine whether particular lithic material concentrations represent different occupations or individual variability within particular occupation areas.

Activities represented by lithic debris at the site include lithic tool manufacturing, tool resharpening, and possibly wood or bone tool manufacturing. The presence of two drills indicates that other manufacturing activities were carried out as well. Unfortunately, both drills were found on the surface and the lack of context prevents us from precisely defining their functions.

Biotic remains were limited to small quantities of bone, seeds, and pollen. Bones, many of which were charred, include limited remains of large herbivores, small mammals, and birds. Seeds which were present in intact deposits indicate that the occupants of West Rosebud Lake were exploiting berries, possibly huckleberry, serviceberry, or kinnickinnick. Pollen evidence suggests that Evening Primrose or Fireweed was brought into the site for processing. The single pollen sample which contained a high proportion of this pollen was taken from an area thought to have been occupied by Late Prehistoric people. Significantly, this pollen dates the occupation to mid-to-late summer, when the flowers were in bloom.

The large number of hearths and charcoal stains attest to cooking and/or heating facilities. The amorphous nature of many of these features makes it difficult to classify them specifically. Other features include three post molds which may represent a tripod drying rack or cooking rack. However, it may be that one or more post molds remain in unexcavated deposits, so that the classification of "tripod" may be erroneous.

An historic cobble feature overlay the prehistoric occupation in Area F. This feature which, based on associated trash, dates around A.D. 1910-1920, appears to represent a temporary tent occupation possibly associated with the construction of the transmission line from the Mystic Lake Hydroelectric facility.

Additional evidence of historic use of the area is in the form of cobble ridges to the south of the site paralleling an old channel of West Rosebud Creek. These ridges apparently represent placer mining although no evidence of such exists in the written record.

Although the West Rosebud Lake Site was not ideal from a research perspective due to problems such as shallow, disturbed soils and poor preservation, information gained from this site serves as a starting point from which archaeologists can learn about the prehistoric use of the Beartooth Mountains. As more sites are investigated, the West Rosebud Lake Site will become more meaningful as part of a pattern of subsistence and settlement in the area.

REFERENCES CITED

Ahler, Stanley A.
1977 Lithic resource utilization patterns in the Middle Missouri Subarea. In Trends in Middle Missouri Prehistory: A Festschrift honoring the contributions of Donald L. Lehmer. Plains Anthropologist 22 (78-2): 132-150.

Annin, James
1964 They gazed on the Beartooths, Volume 2.

Arthur, George W.
1966 An Archaeological Survey of the Upper Yellowstone River Drainage, Montana. Agricultural Economics Research Report No. 26, Montana Agricultural Experiment Station, Bozeman.

Benedict, James B.
1973 Chronology of cirque glaciation, Colorado Front Range. Quaternary Research 3: 584-599.

Benedict, James B. and Byron L. Olson
1978 The Mount Albion Complex: a study of prehistoric man and the Altithermal. Center for Mountain Archaeology, Research Report 1. Ward, Colorado.

Bradley, Bruce A.
1975 Lithic reduction sequences: a glossary and discussion. In Lithic Technology. Making and Using Stone Tools, Earl Swanson, ed. Mouton Publishers, The Hague, pp. 5-14.

Bryan, Alan L. and Ruth Gruhn
1964 Problems Relating to the Neothermal Climatic Sequence, American Antiquity 29(3): 307-315.

Bryson, Reed, David A. Baerreis, and Wayne M. Wendland
1970 The character of late-Glacial and post-Glacial climatic changes. In Pleistocene and Recent Environments of the Central Great Plains, edited by Wakefield Dort, Jr., and Knox Jones, Jr., University of Kansas, Special Publication No. 3.

Denig, Edwin Thompson
1961 Five Indian Tribes of the Upper Missouri. University of Oklahoma Press, Norman.

Ewers, John C.
1955 The horse in Blackfoot Indian culture. Bureau of American Ethnology Bulletin No. 159.

1958 The Blackfeet: Raiders on the North-Western Plains, University of Oklahoma Press, Norman.

Fenneman, Nevin M.
1931 Physiography of Western United States, McGraw-Hill Book Co., Inc., New York.

Frison, George C.
1968 A functional analysis of certain chipped stone tools. American Antiquity 33(2): 149-155.

1978 Prehistoric Hunters of the High Plains, Academic Press, New York.

Frison, George C., Michael Wilson, and Diane J. Wilson
1976 Fossil bison and artifacts from an early Altithermal period arroyo trap in Wyoming. American Antiquity 41(1): 28-57.

Gerstle, Andrea I. and Sally T. Greiser
1977 Form and function of lithic assemblages from the Grand Canyon. Ms. on file with the Grand Canyon National Park.

Good, Kent Nolan
1974 A survey and synthesis of archaeological sites within the Sub-Alpine ecological zone, Pryor Mountains, Montana. M.A. Thesis, University of Montana.

Graf, William L.
1971 Quantitative analysis of Pinedale land forms, Beartooth Mountains, Montana and Wyoming. Arctic and Alpine Research 3(3): 253-261.

Gregg, Michael L.
1977 Final Report: Archaeological Inventory and Assessment for the Mystic Lake Project. Ms. on file at the Custer National Forest Office, Billings.

Greiser, Sally Thompson
1980 Predictive models of hunter-gatherer subsistence and settlement strategies on the Central High Plains. Ph.D. Dissertation, University of Colorado University Microfilm, Ann Arbor.

Greiser, Sally T. and Payson D. Sheets
1979 Raw materials as a functional variable in use-wear studies. In Lithic Use-Wear Analysis, Brian Hayden, ed. Academic Press, New York, pp. 289-296.

Haines, Aubrey L.
1963 A Preliminary Report on High Altitude Indian Occupation Sites Near the North Boundary of Yellowstone National Park, Mss. Report to the National Park Service, Yellowstone National Park.

Haines, Aubrey L.
1965 A supplementary report on High Altitude Indian occupation sites near the north boundary of Yellowstone National Park. Ms. report submitted to the National Park Service, Yellowstone National Park.

Haines, Francis
1938 The northward spread of horses among the Plains Indians. American Anthropologist 40(3): 429-437.

Hall, W. B.
1959 Multiple glaciation and high level till deposits in Southwestern Montana. Geological Society of American Bulletin, Abstract. Vol. 70: 1778.

Harrington, H. D.
1967 Edible native plants of the Rocky Mountains. University of New Mexico Press, Albuquerque.

Hewes, Gordon
1948 Early Tribal Migrations in the Northern Great Plains. Plains Archaeological Conference News Letter, Vol. 4, No. 4.

Hoffman, John H.
1961 A Preliminary Archaeological Survey of Yellowstone National Park, Mss., M.A. Thesis, Montana State University, Missoula.

Hyde, George E.
1959 Indians of the High Plains, University of Oklahoma Press, Norman.

Ives, R. L.
1950 Frequency and physical effects of Chinook winds in the Colorado Plains region. Assoc. of American Geographers, Annals 40:293-327.

Kehoe, Thomas F.
1973 The Gull Lake Site: A prehistoric bison drive site in south-western Saskatchewan. Milwaukee Public Museum, Publication in Anthropology and History, No. 1.

Kirk, D. R.
1970 Wild edible plants of the western United States. Naturegraph Publishers, Inc., Healdsburg, California.

Lahren, Larry A.
1976 The Myers-Hindman Site: An exploratory study of human occupation patterns in the Upper Yellowstone Valley from 7000 B.C. to A.D. 1200. Livingston, Montana: Antropologos Researches International Incorporated.

Lahren, Larry A. and Robson Bonnichsen
1974 Bone foreshafts from a Clovis burial in southwestern Montana. Science 186:147-150.

Loenderf, Lawrence Lee
1967 A Preliminary Archaeological Survey of the Clark Fork River, Carbon County, Montana. University of Montana, Missoula.

McCracken, Harold, et al.
1978 The Mummy Cave Project in Northwestern Wyoming. The Buffalo Bill Historical Center, Cody, Wyoming.

Malouf, Carling
1967 Historic Tribes and Archaeology, Archaeology in Montana, Vol. 8, No. 1, Montana Archaeological Society, Missoula.

Mehringer, Peter J., Stephen F. Arno, and Kenneth L. Peterson
1977 Postglacial history of Lost Trail Pass bog, Bitterroot Mountains, Montana. Arctic and Alpine Research 9(4):345-368.

Montagne, John
1963 Personal communication to Dee Taylor, Preliminary Archaeological Investigations in Yellowstone National Park.

Mooney, James
1898 Calendar history of the Kiowa Indians. Bureau of American Ethnology, Seventeenth Annual Report, Part 1. Smithsonian Institution, Washington, D.C.

Moore, Raymond C.
1958 Introduction to Historical Geology, 2nd Edition, McGraw-Hill, N.Y.

Mulloy, William
1942 The Hagen Site: A Prehistoric Village on the Lower Yellowstone, University of Montana Publications in the Social Sciences, No. 1, Missoula.

1943 A Prehistoric Campsite Near Red Lodge, Montana. American Antiquity 9(2):

1954 The McKean site in northeastern Wyoming. Southwestern Journal of Anthropology 10(4):432-460.

1958 A Preliminary Historical Outline for the Northwest Plains, University of Wyoming Publication, Vol. XXII, Nos. 1 and 2, Laramie, Wyoming.

Murphy, Robert F.
1955 Shoshoni-Bannock subsistence and society. University of California Anthropological Records 16:7.

Reeves, Brian O. K.
1970 Culture Change in the Northern Plains 1000 B.C.-A.D. 1000. Ph.D. Dissertation. Dept. of Archaeology, University of Calgary.

Richmond, Gerald
1972 Appraisal of the future climate of the Holocene in the Rocky Mountains. Quaternary Research 2(3):315-322.

Ross, Robert L. and Harold E. Hunter
1976 Climax Vegetation of Montana: Based on Soils and Climate. U.S. Dept. of Agriculture, Soil Conservation Service, Bozeman, MT.

Rossiter, Raymond
1874 Statistics of mines and mining in the states and territories of the Rocky Mountains being the Sixth Annual Report of the U.S. Commissioner of Mining Statistics, Washington, D.C.

Secoy, F. R.
1953 Changing military patterns on the Great Plains. Monographs of the American Ethnological Society, No. 21.

Shimkin, D. B.
1947 Wind River Shoshone ethnogeography. Anthropological Records 5(4).

Simpson, Tana
1974 Population dynamics of mule deer (Odocoileus hemionus) from the Dead Indian site. Unpublished manuscript on file at the Department of Anthropology, University of Wyoming, Laramie.

Stearn, E. Wagner and Allen E. Stearn
1945 The Effect of Smallpox on the Destiny of the Amerindian. Bruce Humphries Publishers, Boston.

Strong, William Duncan
1935 An introduction to Nebraska archaeology, Smithsonian Miscellaneous Collections 93(10):1-322.

Swanson, Earl H., Jr.
1972 Birch Creek: human ecology in the cool desert of the Northern Rocky Mountains 9000 B.D. - A.D. 1850. Occasional Papers of the Museum, Idaho State University.

Taylor, Dee C.
1964 Preliminary Archaeological Investigations in Yellowstone National Park. Ms. on file with the National Park Service, Yellowstone National Park, Wyoming.

Tiet, James A.
1930 The Salishan Tribes of the Western Plateaus, Bureau of American Ethnology, Forty-fourth Annual Report, Washington.

Wedel, Waldo R., Wilfred Husted, and John Moss
1968 Mummy Cave: Prehistoric record from the Rocky Mountains of Wyoming. Science 160:184-186.

Wetsteon, Gary
1980 Personal communication.

Williams, Kim
1977 Eating wild plants. Mountain Press Publishing Co.

APPENDIX A

PALYNOLOGICAL ANALYSES

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Introduction

Eleven samples from the West Rosebud Lake site (24 ST 651) were submitted for pollen analyses in conjunction with archaeological investigations in the Bitterroot Mountains, Montana.

The samples included two moss polster samples, i.e., clumps of moss or lichen collected to study the modern pollen rain as an analog to the record of the prehistoric samples, and nine soil samples from selected stratigraphic levels within the site (Table I).

The main goals in analyzing these samples were: 1) to recover information about prehistoric diet and use of the environment, and 2) to recover information about the past physical environment and climate.

Laboratory Methods

Pollen was extracted from archaeological soil samples following a precedure adapted from Mehringer (1967) and Schoenwetter (personal communication 1975), involving flotation and screening of the samples, solution of the inorganic fraction in HCl, HF, and HNO_3, and reduction of the organic fraction with caustic soda and Erdtman's acetolysis solution, with increased boiling times to allow for the elevation of the laboratory. The moss polster samples were processed following the INSTAAR Palynology Laboratory standard procedures for such samples: screening, caustic soda, HF, and acetolysis (see Faegri and Iversen 1975).

Counting and Analysis

All samples yielded sufficient pollen for analysis. However, pollen preservation was generally poor in the archaeological soil samples, and there was a large amount of debris, including charcoal fragments, on the slides; counting was therefore often slow and difficult. Because of the generally low

TABLE I

POLLEN SAMPLES, WEST ROSEBUD LAKE, MONTANA

SAMPLE NUMBER	LEVEL	PROVENIENCE
1		Polster; West Rosebud Lake, shore of tributary
2		Polster; West Rosebud Lake, 50 m. upslope from #1
3	99.06	10N, 31E/NW Quad
4	99.03	10N, 30E/SW Quad; charcoal sample from hearth, F#2; possibly contaminated (Greiser, p.c., 1979)
5	99.00	10N, 31E/NW Quad
6	98.91	12N, 28E/NE Quad, East Balk
7	98.96	12N, 28E/NE Quad, East Balk
8	98.92	16N, 28E/NE Quad, North Wall
9	98.89	16N, 28E/NW Quad, North Wall
10	98.86	16N, 32E/SW Quad
11	98.88	16N, 32E/SW Quad

density of the pollen, the archaeological soil sample slides were counted at low power (200X); in most cases, the entire slide had to be counted and occasionally it was necessary to count two slides per level in order to maximize the total count. An exception was sample #4 (10N, 30E/SW Quad, 99.03) in which 400 grains were counted in approximately one-half of the slide area; however, the excavation notes suggest this sample might be contaminated (Greiser, personal communication 1979). This is in part supported by comparison to the polster samples which contained abundant, well preserved pollen in which the pollen density was high enough to count at 500X magnification and produce a standard 300-count (see Table II for a summary of this data).

TABLE II

SUMMARY OF POLLEN COUNT DATA

SAMPLE NO.	# POLLEN COUNTED	NO. SLIDES	MAGNIFICATION	NO. TRAVERSES*
1	300	1	500X	4.82
2	300	1	500X	3.15
3	100	1	200X	20.33
4	400	1	200X	19.50
5	61	1	200X	35.4
6	69	2	200X	70.8
7	69	1	200X	35.4
8	123	2	200X	70.8
9	64	1	200X	35.4
10	50	1	200X	35.4
11	65	1	200X	35.4

* 200X = 35.4 traverses/slide
500X = 87.9 traverses/slide

The sparseness of pollen in archaeological soil samples is not uncommon. In a study of pollen analysis of soils, Dimbleby (1957) states that alkaline soils, especially those with a pH greater than 6, are virtually useless for pollen analysis because of the decomposition of the grains. Another problem is the differential destruction of pollen, especially smaller or fragile grains, in soils. "Dilution" of the pollen rain by the soil is yet another factor to consider, and, in addition, the pollen content of soils is reduced by fire (Dimbleby 1957:27).

In the Southwest, pollen researchers often exclude various pollen types from their total sum, according to their research design. In general, they are interested in separating out the effects of human activity, including agriculture, on the vegetation and therefore on the pollen rain, from climatic change. However, there is no consensus on what to exclude from the pollen sum or what constitutes an economic pollen type. Therefore, the percentage data presented in this study are based on a count with no exclusions.

Pinus contorta (lodgepole pine) was not distinguished from *Pinus ponderosa* (ponderosa or yellow pine) in this study. The size of pine pollen is often used as an index to species (Hansen and Cushing 1973). However, the reliability of size frequency identification of eastern pine species has been criticized by Whitehead (1964). Therefore, because of the fragmentary condition of the grains and because ponderosa pine does not occur in the area (see discussion below), I did not undertake the very time-consuming analysis.

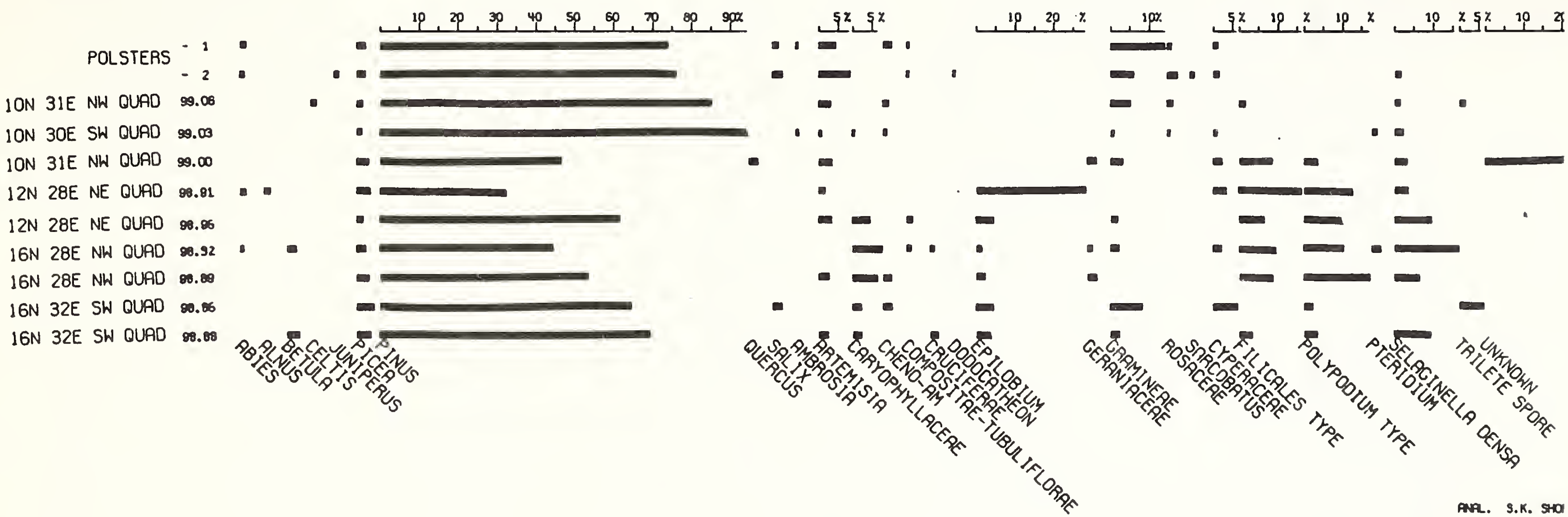
The Cheno-am group combines the pollen of the Chenopodiaceae (goosefoot family) and *Amaranthus* (pigweed); it is almost impossible to distinguish the pollen types of this group using a light microscope, and the two are often combined.

Computer programs developed at INSTAAR (Eccles, Hickey, and Nichols 1979) were used to calculate the data and produce a percentage diagram (Figure 1).

Common names for all pollen and/or vegetation types used in this report can

Figure 1. Percentage pollen diagram, West Rosebud Lake, Montana.

WEST ROSEBUD LAKE (24 ST 651), MONTANA - PERCENTAGE DATA



be found in Appendix I.

Site Description

The West Rosebud Lake site (WRL-24 ST 651) ($45^{o}15'N$, $109^{o}40'W$) is located at an elevation of 6398' (1950 m) ASL in the Beartooth Mountains, Montana. It is located in the climax subalpine fir (Abies lasiocarpa)- Douglas-fir (Pseudotsuga menziesii) vegetation zone. Englemann spruce (Picea englemanni) and and lodgepole pine (Pinus contorta) are less important components of this community; however, the latter is fairly common in the site area due to its ability to move into this vegetation community with the loss of the climax overstory (e.g., fire, logging, disturbance). Ponderosa pine (Pinus ponderosa) does not occur as climax vegetation within 250 miles of the site (Ross and Hunter, 1976).

Pollen Analyses (Figure 1)

Polsters

The two polster samples are dominated by large Pinus (pine) percentages (74% and 76%). Sample #1 is further characterized by moderate Gramineae (grass family) (14%), and sample #2 records this study's manimum Artemisia (sage) percentage (8%); in both samples, most other taxa record low values.

These spectra indicate a common problem when dealing with members of the Pinaceae (pine family): Pinus is a notorious over-producer of pollen, which in turn, can be transported over very long distances; thus, Pinus is often overrepresented in pollen spectra. The vegetation dominants, Abies and Pseudotsuga, are dramatically underrepresented (indeed, Pseudotsuga pollen was not recovered in this study), and Picea is also underrepresented to a smaller degree, fir, Douglas-fir, and spruce are not as productive in pollen production as pine nor are the larger, heavier grains of these taxa generally transported as far or as easily as pine pollen grains. In addition, Pseudotsuga grains are large and fragile and easily torn, and therefore subject to differential destruction. As discussed above, pine size studies were not done, but in general observations during counting suggest only one population.

Archaeological Soil Samples

10N, 31E/NW Quad/99.06 (#3)

This sample is dominated by Pinus (85%); Gramineae (5%) and Artemisia (3%) values are low and all other taxa register very low values. Although the pine value is larger than that recorded in the moss polsters, the pollen spectrum does not suggest conditions significantly different form the present.

10N, 30E/SW Quad/99.03 (#4)

This sample records the largest Pinus value (94%) in this study. However, it was suspected of contamination in the field, and I believe that the very large pine percentage plus the fact that it was the only fossil soil sample to produce a 400-count (see Table II) supports the field observation. Thus, the data cannot be used in this study.

10N, 30E/NW Quad/99.00 (#5)

Because of a large number of Unknown pollen types (25%), percentages for all other taxa are depressed. However, if totals are recalculated excluding the Unknown category, the Pinus value is raised from 46% to 78%, thus resembling the moss polster spectra.

Fourteen of the fifteen Unknown grains are one type: small, round with large verrucae and gemmae; it is probable that this grain is a moss spore. Therefore, this pollen spectra, although dominated by Pinus, is also characterized by moss and Filicales (fern group) taxa, probably suggesting the closeness of moist habitats to the site. It is also possible that the large moss (i.e., Unknown) value is indicative of the importation of moss into the site for an unknown purpose.

12N, 28E/NE Quad/East Balk/98.91 (#6)

This sample is dominated by Pinus (32%) and Epilobium (fireweed) (28%) pollen; Filicales and Polypodium (polypody, fern family) are also important. Epilobium, and many other members of the Onagraceae (Evening Primrose family; members of this family may be included in the Epilobium category) prefer moist ground or wood edge locations and are also indicative of disturbance activities, including fire. The pollen of this family are large and do not travel long distances. Therefore, the large Epilobium value in this pollen spectrum indicates either its close proximity to the site or its importation into the site as a food plant. Many parts of Epilobium and other Onagraceae are edible, including the young shoots (greens), leaves (potherb, tea), roots, and the pith of the mature plant (Harrington 1967; Kirk 1975). The plant flowers in mid-summer; therefore, not only does this suggest a mid-summer occupation for this level, but it indicates that if the plant was being imported as a food plant, the leaves, pith or roots (rather than the young shoots) were being used. It is not possible, however, to state definitively that the Epilobium represents an economic taxa here; the moderately large percentages recorded for Filicales and Polypodium plus the Epilobium value may indicate an increase in disturbed ground, a common result of increased human activity in an area, or an increase in the moisture regime.

12N, 28E/NE Quad/East Balk/98.96 (#7)

The pollen spectrum of this sample is dominated by Pinus (61%) with moderate values registered for Filicales (6%), Polypodium (9%) and Selaginella densa (rock selaginella) (9%). The importance of ferns and fern allies at this level (and in several other samples; see discussion below) is not easy to interpret as they occupy a wide range of habitats. However, in general, ferns suggest two main interpretations: 1) open woods, clearings, burns, etc., or 2) cool ravines, moist areas. Thus, the pollen spectrum from this level can be interpreted either as indicative of a decrease in forest cover in the immediate site vicinity due to clearing activities, fire, etc. or to an increase in the moisture regime. Only one fern (*Pteridium*, bracken fern) is generally recorded as edible (Harrington 1967; Kirk 1975), but I suspect that other fern types could be used as a food source also. *Selaginella densa*, however, is not recorded as an edible plant. It is possible that these plants were being imported into the site for other reasons, but I do not know of any ethnographic evidence of their use.

16N, 28E/NW Quad/North Wall/98.92 (#8)

This sample is characterized by moderate *Pinus* (44%), Filicales (9%), and *Polypodium* (10%) percentages and a study maximum *Selaginella densa* (16%) value. Again, the importance of the ferns and fern allies may suggest either a decrease in forest cover or an increase in the moisture regime. The possible use of these plants as economic types is not known.

16N, 28E/NW Quad/North Wall/98.89 (#9)

This sample records moderate *Pinus* (53%), Caryophyllaceae (pink family) (6%), Filicales (8%), and *Selaginella densa* (4%) percentages and a peak *Polypodium* (17%) value. Following the above discussion, two possible explanations for this pollen spectrum have been proposed.

16N, 32E/SW Quad/98.86 (#10)

This sample is characterized by moderately large *Pinus* (64%); Gramineae and Cyperaceae (sedge family) register moderate values and an unidentified trilete spore (i.e., a moss type) contributed 6%. The grass and sedge values suggest some open ground (both mesic and wet areas, respectively) near the site location.

16N, 32E/SW Quad/98.88 (#11)

This sample is dominated by a moderately large Pinus (69%) value and a moderate Selaginella densa (9%) percentage. All other taxa register small values. The pine value is similar to present-day values and suggests forest cover conditions not too different from the present. However, the contribution of rock selaginella has been interpreted in several other samples as indicative of either a decrease in tree density in the site vicinity or an increase in moist habitats around the site; the possibility of its importation into the site as an economic type has also been raised. I believe that the rock selaginella value can only be interpreted as indicative of conditions in the immediate site vicinity and that forest conditions in the regional area were similar to that of today.

Discussion

The archaeological soil samples from West Rosebud Lake (24 ST 751), Montana, in general support an interpretation of environmental and climatic conditions not greatly different from the present. Several levels record moderate values of several ferns and fern allies; as discussed above, the wide ecological tolerance range of those taxa make it difficult to interpret these spectra. In general, they can be considered as indicators of conditions only in the immediate site area, and therefore, it is suggested that they represent a (slight) decrease in forest cover in the site vicinity due to clearing, fire, or general human disturbance and/or an increase in wet/moist habitats around the lake.

Evidence of only one possible economic pollen type was recovered in this study: Epilobium cf. (12N, 28E/NE Quad/East BA1k/98.91). However, limited evidence for the use of fern types was also discussed and the general lack of data on their use in th ethnographic literature was raised.

REFERENCES CITED

Dimbleby, D. W. 1957. Pollen analysis of terrestrial soils. The New Phytologist 56:12-28.

Eccles, M., M. Hickey, and H. Nichols. 1979. Computer techniques for the presentation of palynological and paleoenvironmental data. Institute of Arctic and Alpine Research, Occasional Paper No. 16:139 p.

Faegri, K. and J. Iversen. 1975. Textbook of Pollen Analysis, 3rd edition. Hafner Publishing Company, New York.

Greiser, S. T. 1979. Personal communication.

Hansen, B. S. and E. J. Cushing. 1973. Identification of pine pollen of late Quaternary age from the Chuska Mountains, New Mexico. Geological Society of America Bulletin 84:1181-1200.

Harrington, H. D. 1967. Edible Native Plants of the Rocky Mountains. University of New Mexico Press, Albuquerque. 391 p.

Kirk, D. R. 1975. Wild Edible Plants of the Western United States. Naturegraph Publishers, Inc., Healdsburg, California. 307 p.

Mehringer, P. J., Jr. 1967. Pollen analysis of the Thule Springs site. In: M. Wormington and D. Ellis (eds.), Pleistocene Studies in Southern Nevada. Nevada State Museum Anthropological Papers No. 13:130-200.

Ross, R. L. and H. E. Hunter. 1976. Climax vegetation of Montana. U.S.D.A., Soil Conservation Service.

Schoenwetter. 1975. Personal communication.

Whitehead, D. R. 1964. Fossil pine pollen and full-glacial vegetation in south-eastern North Carolina. Ecology 45:767-777.

APPENDIX I

Abies	Fir
Abies lasiocarpa	Subalpine fir
Alnus	Alder
Ambrosia	Ragweed
Artemisia	Sage
Betula	Birch
Caryophyllaceae	Pink family
Celtis	Hackberry
Cheno-am	Goosefoot-pigweed group
Compositae-Tubuliflorae	Sunflower family
Cruciferae	Mustard family
Cyperaceae	Sedge family
Dodocatheon	Shooting-star
Epilobium	Fireweed
Filicales	Fern group
Geraniaceae	Geranium family
Gramineae	Grass family
Juniperus	Juniper
Onagraceae	Evening-primrose family
Picea	Spruce
Picea englemanni	Englemann spruce
Pinaceae	Pine family
Pinus	Pine
Pinus contorta	Lodgepole pine
Pinus ponderosa	Ponderosa or yellow pine
Polypodium	Polypody (fern family)
Pseudotsuga menziesii	Douglas-fir
Pteridium	Bracken fern
Quercus	Oak
Rosaceae	Rose family
Salix	Willow
Sarcobatus	Greasewood
Selaginella densa	Rock selaginella

APPENDIX B

OBSIDIAN HYDRATION AND PROTON ACTIVATION DATA

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APPENDIX B. OBSIDIAN HYDRATION AND PROTON ACTIVATION DATA

WEST ROSEBUD LAKE SITE (24 ST 651)

Sample #	Provenience	Ti	Mn	Fe/O	K	Ca	Fe	Rb	Sr	Zn	Hydration Rim Thickness (microns)
79/10	8N/30E 10cm b.s.	26.5	13.6	59.9	28.4	61.1	10.5	52.4	2.6	44.95	3.1
79/15	10N/30E 12.5cm b.s.	30.2	12.8	57.0	29.2	59.8	11.0	51.4	2.9	45.7	2.9
79/16	10N/30E 12.8cm b.s.	--	--	--	--	--	--	--	--	--	3.2
79/21	10N/30E 13.5cm b.s.	--	--	--	--	--	--	--	--	--	too small
79/22	10N/30E 14cm b.s.	--	--	--	--	--	--	--	--	--	too small
79/39	12N/28E cl. 98.91	--	--	--	--	--	--	--	--	--	too small
79/40	12N/28E cl. 98.91	54.2	8.5	37.3	24.3	66.0	9.7	50.1	2.2	47.7	2.7
79/50	12N/18E 9cm b.s.	29.0	12.2	58.7	28.9	58.7	12.5	50.0	2.7	47.3	3.0
79/57	12N/30E 13cm b.s.	--	--	--	--	--	--	--	--	--	too small
79/60	12N/30E 15cm b.s.	--	--	--	--	--	--	--	--	--	too small
79/65	12N/34E L.5-10	56.5	8.8	34.7	22.6	67.4	10.0	32.4	8.3	59.3	3.0
79/68	12N/34E 19cm b.s.	28.4	12.8	58.8	30.6	58.7	10.7	49.8	2.1	48.0	2.5
79/69	12N/34E 20cm b.s.	34.0	12.2	53.8	30.2	59.3	10.5	53.3	1.8	44.9	2.4
79/70	12N/34E 21cm b.s.	28.8	13.0	58.2	30.3	58.0	11.7	53.4	2.2	44.5	2.8
79/72	12N/34E --	29.3	13.1	57.6	30.5	59.8	9.7	52.7	3.2	44.1	2.8
79/94	14N/28E --	--	--	--	--	--	--	--	--	--	too small
79/104	14N/30E L 20+	24.6	13.8	61.6	30.9	57.2	11.9	52.3	2.6	45.1	2.7
79/108	14N/32E cl 98.91	35.1	12.5	52.4	29.2	60.3	10.5	53.8	2.1	44.1	2.3
79/110	14N/32E 23cm b.d.	--	--	--	--	--	--	--	--	--	too small
79/117	16N/28E L. 16.5-22	--	--	--	--	--	--	--	--	--	too small
79/119	16N/28E 27 b.d.	31.1	12.2	56.7	31.1	58.6	10.2	50.3	2.6	47.1	2.5
79/120	16N/28E 28 b.d.	42.8	10.3	46.9	30.3	61.4	8.3	50.6	3.0	46.4	3.1
79/133	16N/30E 32 b.d.	42.8	10.1	47.8	25.6	62.1	12.3	50.7	3.4	45.9	2.8
79/163	16N/30E 36 b.d.	--	--	--	--	--	--	--	--	--	too small
79/175	16N/32E 15-17 b.d.	--	--	--	--	--	--	--	--	--	3.3

Sample #	Provenience	Ti	Mn	Fe/O	K	Ca	Fe	Rb	Sr	Zn	Hydration Rim Thickness (microns)
79/176	16N/32E 17 b.d.	--	--	--	--	--	--	--	--	--	too small
79/190	20N/36E L. 5-10	--	--	--	--	--	--	--	--	--	2.5
79/192	14N/28E 15-20 b.s.	--	--	--	--	--	--	--	--	--	no hydration
79/193	12N/30E L.15-25	--	--	--	--	--	--	--	--	--	3.1
screen 1	16N/30E 25-30 b.s.	--	--	--	--	--	--	--	--	--	3.4
screen 2	12N/30E 15-25 b.s.	--	--	--	--	--	--	--	--	--	4.1
screen 3	14/30E 18-21 b.s.	--	--	--	--	--	--	--	--	--	3.2
screen 4	14N/30E 17-20 b.s.	--	--	--	--	--	--	--	--	--	no hydration
78/1	13.25 5.4E surface	--	--	--	--	--	--	--	--	--	2.1
73/5	14N/21-23E level 0-10	--	--	--	--	--	--	--	--	--	2.9
78/9	20S/4E	--	--	--	--	--	--	--	--	--	no hydration
78/11	12N/22E level 13-23	--	--	--	--	--	--	--	--	--	3.1
78/16	22S/4E	--	--	--	--	--	--	--	--	--	3.0
78/23	8N/22E level 10-18	--	--	--	--	--	--	--	--	--	2.7
78/24	4N/14E	--	--	--	--	--	--	--	--	--	1.9
78/35	14N 23-25 E	--	--	--	--	--	--	--	--	--	2.4
78/39	16N/21-23E Level 1	--	--	--	--	--	--	--	--	--	2.6
78/45	19-21N 39-41E 10-20 b.s.	32.6	11.1	56.4	29.4	56.3	14.3	54.4	0.	45.6	2.5
78/56	18N/34E	--	--	--	--	--	--	--	--	--	3.0
78/60	6N/14-15E level 0-10	--	--	--	--	--	--	--	--	--	no hydration
78/63	12N/22E lev. 13-23	--	--	--	--	--	--	--	--	--	1.8
78/64	12N/22E lev. 13-23	26.7	13.3	60.0	30.0	56.8	13.2	52.6	1.4	45.9	2.9
78/77	18N/36E lev. 5-10	--	--	--	--	--	--	--	--	--	no hydration
78/84	18N/4E lev. 0-10	--	--	--	--	--	--	--	--	--	3.4
78/85	18N/4E lev. 0-10	--	--	--	--	--	--	--	--	--	no hydration
78/98	17-19N 37-39E lev. 0-15	--	--	--	--	--	--	--	--	--	3.6

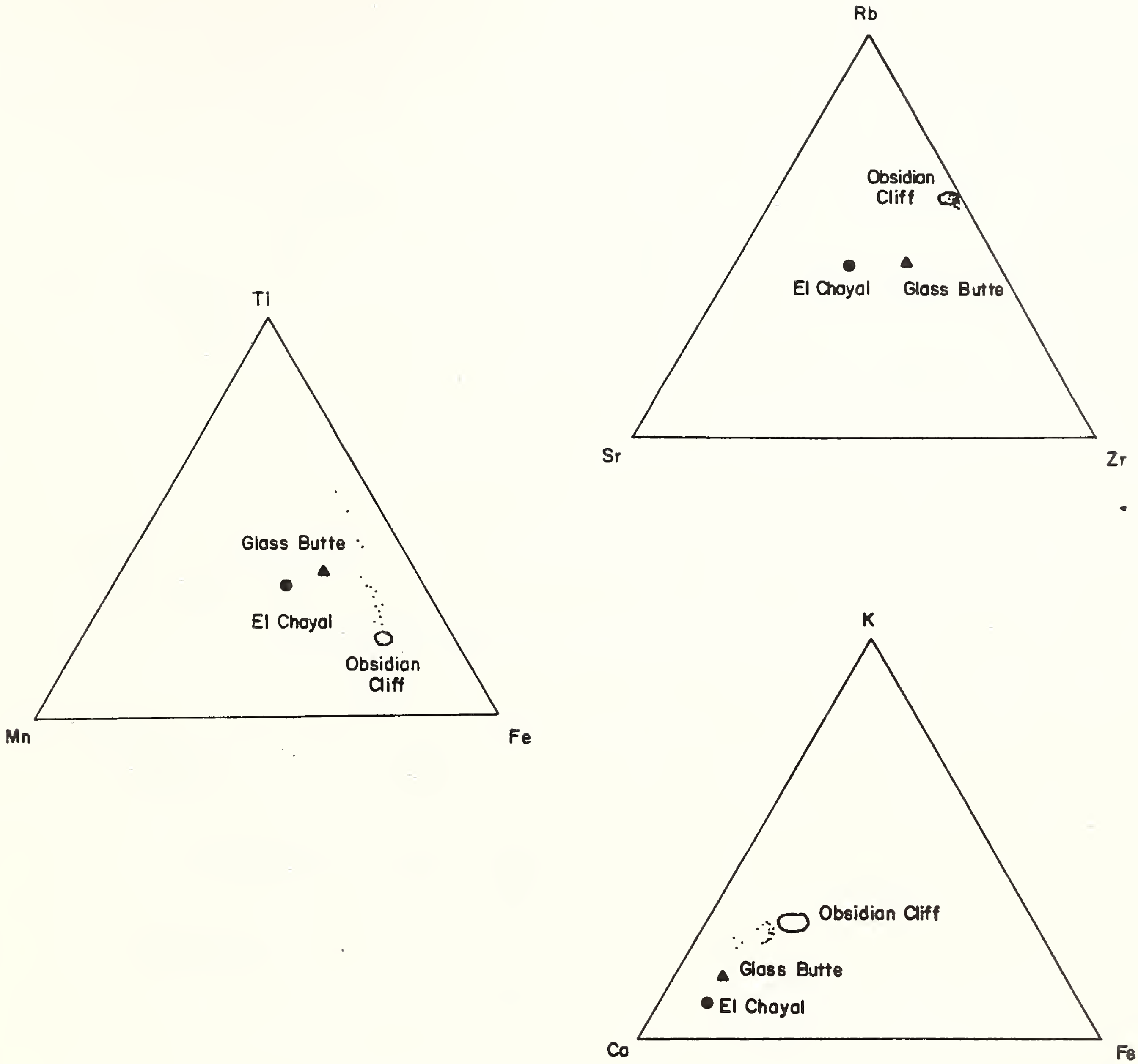

Figure 1. Plot of particular trace element composition of West Rosebud Lake specimens in comparison to Obsidian Cliff, Glass Butte, and El Chayal.

APPENDIX C

SOILS OF THE WEST ROSEBUD LAKE SITE

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INTRODUCTION

Soil investigations can be of great importance in any archaeological studies. Soils information can be used to identify remnant land surfaces buried by more recent sediment (Ruhe 1969), to date, in a relative sense, the age of remnant surfaces (Morrison 1967), to identify erosional surfaces, and even to locate areas of intensive human occupation (Soil Survey Staff 1975). Analysis of the kinds and amounts of soil constituents (organic matter, sand, clay, elemental content) are used for dating purposes, while phosphorus content (P) is most often used for identifying areas of human occupation (Eidt 1977). Bones, food trash, and human waste accumulating over many years can cause large P and organic matter accumulations which can persist for hundreds to tens of thousands of years due to the immobility especially of soil P. Soil texture differences have also been widely used to separate soil materials whichwere deposited at different times or by different processes. Changes in the depositional processes involved in soil formation generally result in abrupt changes with depth in the relative proportions of silt, clay, and sand.

The West Rosebud Lake study area is located at the northern edge of the Beartooth mountains in Stillwater County, Montana, at an elevation of 6,500 feet. It appears that the lake, now dammed by Montana Power Company, was originally a glacial lake entrapped by a Pinedale (late Wisconsinan) recessional or terminal morraine. The freshness and morphology of the till around the lake and downstream indicates the Pinedale age (12,000 yrs. B.P.; Richmond 1965). The actual archaeological site is on a benchlike terrace above the West Fork of Rosebud Creek where it meanders in a meadow above the lake. The relationship of the flat meadow to the lake contours and to the steep-walled canyon upstream suggest that the site was originally the lakeshore sometime before the morraine enclosing the lake was downcut by the drainage channel. The site is also bordered by a steep colluvial slope which has probably shed some coarse debris into the study area. A low mound between the excavation area and the stream contained well-sorted cross-bedded sands beneath a veneer of gravelly glacial till. This linear mound-like feature is probably an esker or ice marginal kame terrace glacial outwash feature (Reinecke and Singh 1975). The geologic setting of this area will help to establish maximum dates for the archaeological site.

METHODS OF STUDY

Field Morphology

Soils were described in the field using standard terminology (Soil Survey Staff 1975). Pits were excavated every four meters along a north-south and east-west transect which intersected at control stake 16N,30E. A total of 16 pits were excavated to a depth of one meter or below the buried "anthrosol." Soil samples for lab analysis were collected from alternate pits from each observable soil horizon. Abbreviated soil descriptions with horizon designations, texture, color, and depth are presented in Appendix A. From the field descriptions, a stratigraphic cross-section of the study area was prepared (Fig. 1 and Fig. 2) showing the extent and depth of the buried paleosol of interest in this investigation.

Laboratory

Forty samples were collected from a total of 11 soil pits for laboratory analysis including organic matter content, total nitrogen, mechanical analysis, sand fractionation, and extractable P. A modified colorimetric Walkley-Black wet oxidation method was used for analyzing organic matter content, while a Kjehdahl digestion was used for total nitrogen (Soil Survey Staff 1972). The Bouyoucos hydrometer method was used for determining sand, silt, and clay content. Then the same sample was dry-sieved for determination of the relative abundance of the sand fractions. Finally, a weak Bray extractant (.03$\underline{M}$ NH_4F and .025 $\underline{M}$ HCl) was used to extract P. This method should reveal P enrichment due to human occupation because it extracts calcium phosphates, found in bone and other organic wastes.

RESULTS

Field data are presented in Appendix A, while soil stratigraphic cross-sections are shown in Figures 1 and 2. Laboratory data are presented in Table 1. Ratios of the coarse and fine sand fractions indicate that samples 3E, 5E, and 4W are distinctly different than the remainder of the samples. They also were observed to be either derived from stratified outwash and till or colluvial material. The remainder of the samples were texturally similar indicating they were all potentially within the area with the buried paleosol, which in turn was underlain by glacial till. The distribution of organic matter, P, and rock fragments with depth in these remaining sites reveals the buried soil profile (Figure 3). Natural soils tend to have gradual decreases in organic matter and P with depth while having nearly constant rock fragment contents. All of these properties change abruptly at a similar depth which corresponds to the II A1 horizon or the buried paleosol surface. All that can be said about the age of this surface is that it is Pinedale or post-Pinedale (12,000 years B.P.) but is older than 100 to 200 years judging from soil development and tree growth in the soil burying the paleosol. It is hoped that radiocarbon dating from the II A1 horizon will further validate the correct soil age.

There is no "stone line" at the top of the paleosol, and the buried A horizon (surface horizon) remains intact indicating that the surface did not experience extensive erosion before burial. Mottles described in the II C1m horizon (the deep subsoil of the buried soil) form under the influence of fluctuating water tables. The area now is probably too far above the stream floodplain for mottles to form under current conditions. The existence of mottles is therefore evidence of a higher lake level in the past indicating again the site was the lakeshore immediately after the Pinedale ice retreat.

It is interesting that only a minimal increase in extractable P and organic matter exists at the buried paleosol surface. The II A1 horizon is very distinct morphologically which would suggest that P and organic matter levels would be much higher in this layer if it had been used extensively by humans. Slow decay of organic matter could account for its absence, but P is immobile in soils and does not readily break down. The lack of large P accumulation suggests that this site was not intensively used for long, continuous periods of time (i.e., several hundred years).

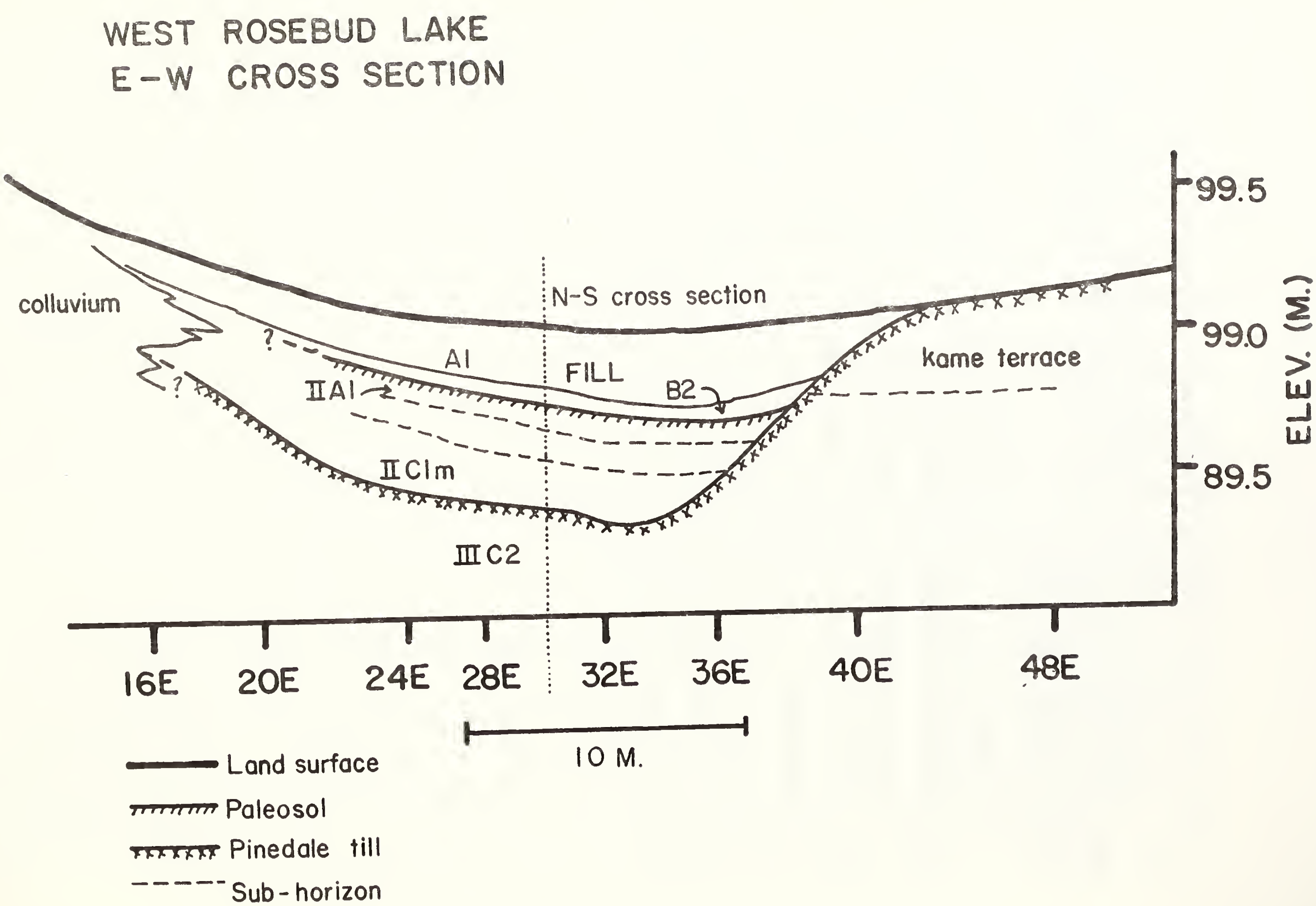

Figure 1. East-west soil-stratigraphic cross-section of the West Rosebud Lake archaeological site, Stillwater County, Montana.

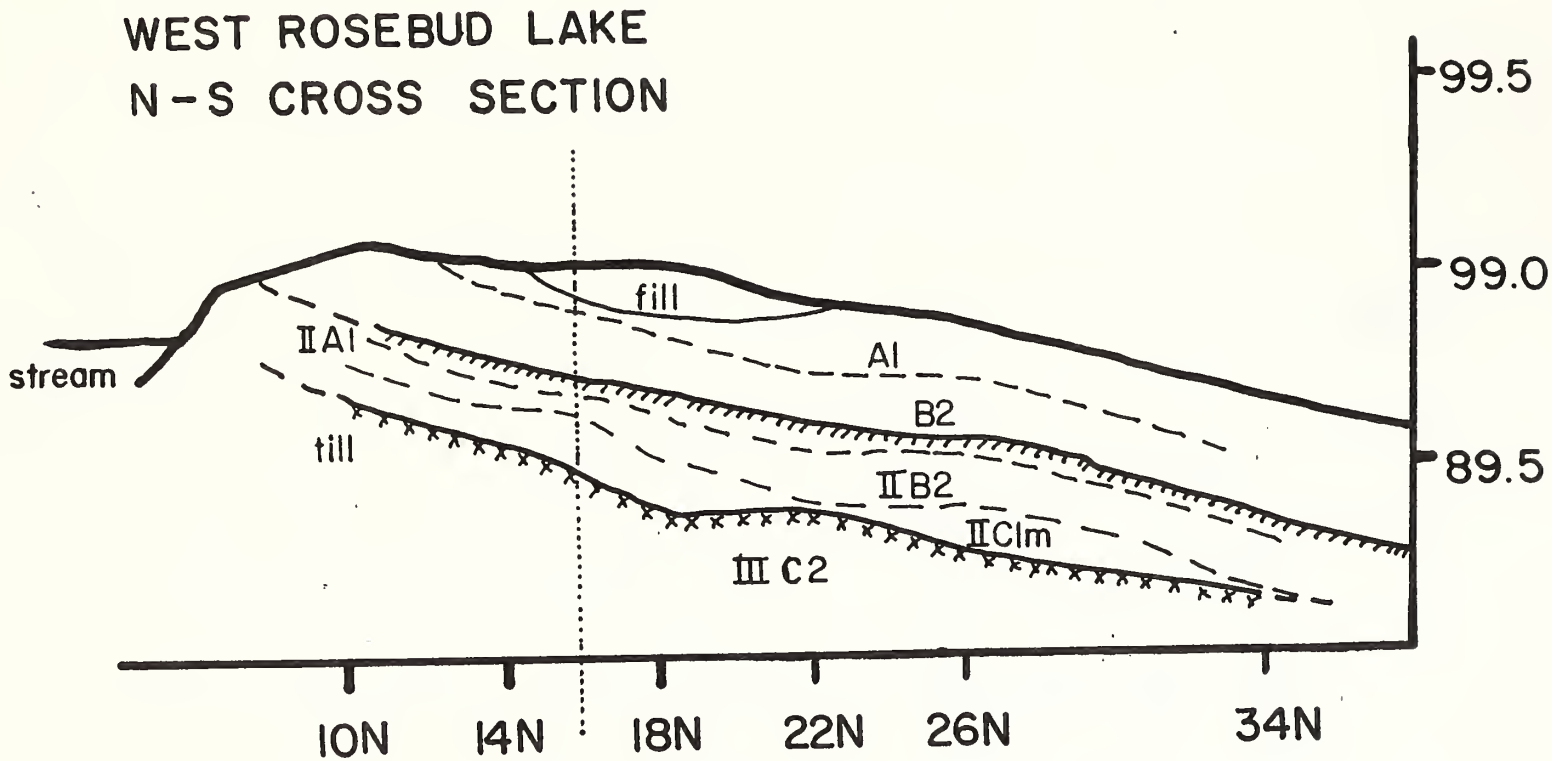

Figure 2. North-south soil-stratigraphic cross-section of the West Rosebud Lake archaeological site, Stillwater County, Montana.

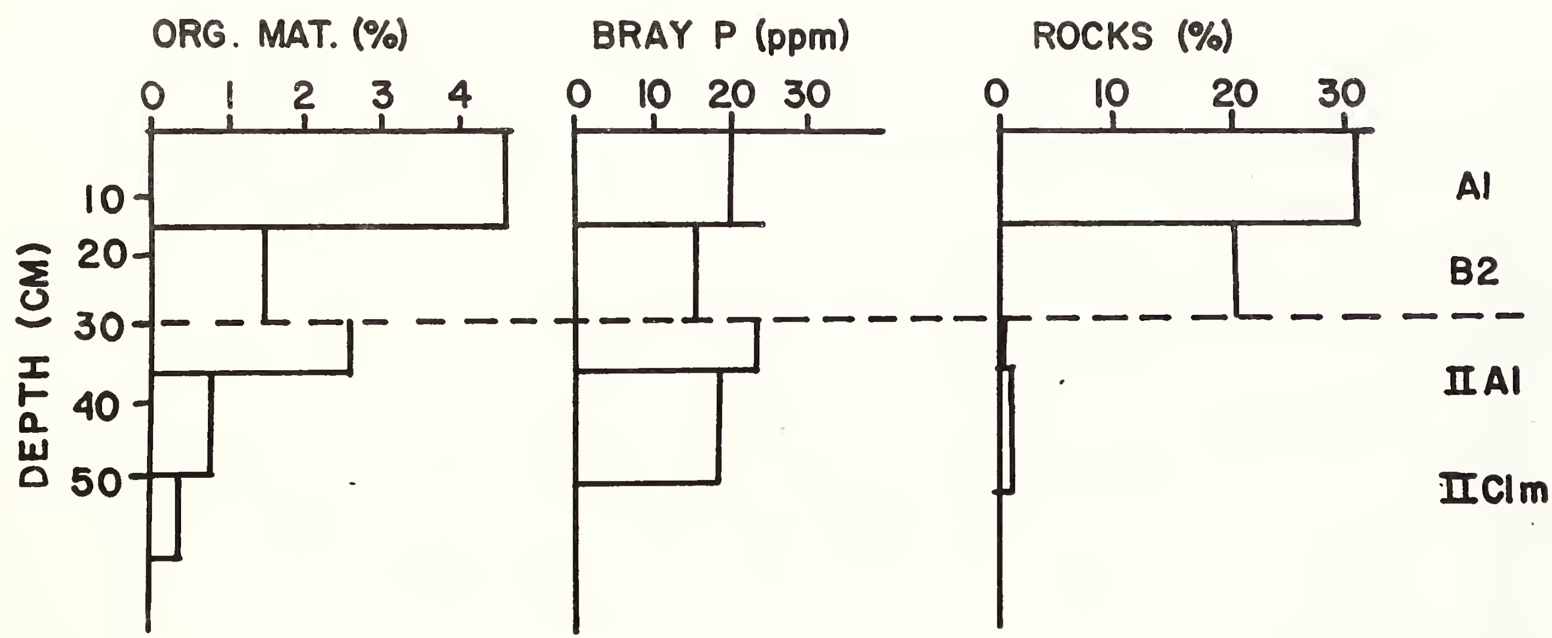

Figure 3. Distribution of organic matter, extractable phosphorus, and rock fragments (2mm) in three representative profiles at the West Rosebud lake site. Abrupt changes in these poperties with depth help locate the buried paleosol.

TABLE I. Laboratory analysis of samples from the West Rosebud Lake site.

SAMPLE	DEPTH (cm)	HOR.	% ORGANIC MATTER	% TOTAL NITROGEN	C/N	% Total by Sieve VCOS	COS	MS	FS	VFS	TOTAL S (sieve)	% Total Hydrometer SAND	SILT	CLAY	≥2 mm % ROCK <3/4"	ROCK ≥3/4"	LITTER	BRAY EXT. P (ppm)
IN2	14-23	AI	1.7	.08	13	1.1	5.4	15.7	27.2	17.2	66.5	66.9	27.9	5.2	5	10	-	24.7
IN3	23-33	B2	1.3	.06	14	0.9	3.9	8.4	30.6	28.1	71.8	75.5	21.5	3.1	2	-	-	15.9
IN4	33-38	IIA1	<.1	-	-	22.0	31.2	23.2	9.3	3.0	88.7	91.6	6.6	1.8	40	15	-	23.1
IN5	38-48	IIB2	.5	.03	10	5.3	15.8	19.1	20.5	11.4	72.2	74.2	21.5	4.3	T	-	-	14.0
IN6	48-67	IICm	.4	.01	-	3.2	14.0	24.7	22.0	10.6	74.4	77.7	18.0	4.3	T	-	-	8.1
3N1	0-16	A1	4.7	.24	12	9.2	15.6	20.0	23.3	11.0	78.9	79.2	18.7	2.2	12	2	-	29.6
*3N2	16-31	B2	1.5	.08	12	1.4	5.8	12.0	32.0	21.2	72.2	69.4	26.7	4.0	5	2	-	23.6
3N3	31-36	IIA1	2.6	.12	14	1.8	9.1	12.7	24.9	16.6	65.1	68.0	27.1	4.9	T	-	-	20.5
3N4	36-49	IIB2	.8	.04	13	4.3	14.4	16.3	18.7	10.6	64.2	66.7	27.1	6.2	T	-	-	16.1
3N5	49-61	IICm	.3	.03	7	3.8	10.3	15.2	21.8	11.5	62.5	66.7	27.1	6.2	T	-	-	16.7
5N1	0-15	A1	1.9	.08	15	14.5	21.6	17.8	17.5	10.1	81.5	78.0	21.5	0.5	30	2	15	20.2
5N2	15-32	B2	3.6	.15	15	9.1	14.1	17.0	22.5	10.7	73.4	72.9	23.8	3.3	15	5	-	16.7
5N3	32-36	IIA1	3.9	.15	16	1.1	6.4	10.6	17.7	15.8	51.5	49.8	43.2	7.1	T	-	-	22.1
5N4	≥ 36	IIA2	3.0	.12	16	4.6	10.7	12.5	16.4	14.9	45.7	57.0	37.5	5.5	2	0	0	19.5
1S1	0-18	A1	1.5	.06	16	3.3	9.2	19.9	25.0	14.2	71.5	74.2	24.3	1.5	4	3	5	46.3
1S2	18-25	B2	.4	.02	13	6.3	16.3	16.9	19.2	10.8	69.4	81.2	16.7	2.1	5	-	-	29.3
1S3	25-29	IIA1	.8	.03	17	3.7	8.6	13.6	24.5	16.3	66.7	72.9	23.4	3.7	10	-	-	22.7
1S4	29-44	IICm	.9	.04	14	3.2	14.3	16.2	20.9	15.5	70.0	70.6	26.1	3.4	10	15	-	21.1
2S1	0-10	A1	.3	.02	9	4.3	13.2	24.2	23.2	12.8	77.7	77.8	20.4	1.8	30	-	-	21.1
*2S2	10-20	B2	.2	.02	-	2.5	9.0	15.2	27.9	16.7	71.2	74.2	25.7	0.1	T	-	-	15.8
2S3	≥ 20	IIA1	.3	.03	-	5.5	12.8	15.6	23.5	12.9	70.2	75.3	23.6	1.2	3	-	-	14.8
1E1	0-24	A1	1.8	.07	16	2.5	8.3	14.6	22.7	18.4	66.5	65.8	28.6	5.6	5	-	2	29.9
1E2	24-38	IIA1	.4	.02	13	8.7	16.3	18.0	19.1	11.0	73.0	72.9	23.1	4.0	15	10	-	25.8
1E3	38-48	IIB2	.3	.02	9	9.2	15.2	15.7	16.5	10.9	67.4	71.9	25.6	2.1	15	-	-	13.9
1E4	48-64	IICm	.4	.02	13	8.8	14.8	16.2	16.8	10.8	67.5	71.9	26.0	2.1	10	-	-	11.7
3E1	0-8	A1	3.6	.11	21	4.6	12.6	17.3	22.0	12.5	69.0	71.8	26.7	1.5	5	-	10	52.0
3E3	≥ 26	IIC1	.1	.01	-	14.6	29.4	23.2	12.1	4.9	84.1	86.0	13.4	0.6	12	-	-	36.9
5E1	0-11	A1	3.5	.13	17	11.0	19.3	17.8	17.3	9.5	74.9	77.8	22.9	0.0	10	15	-	55.4
5E2	11-25	B2	1.1	.04	17	17.6	22.3	22.4	15.0	6.0	83.2	85.9	13.9	.2	30	35	-	41.6
5E3	25-35	C1	.2	.02	-	33.3	35.3	17.3	6.1	2.6	94.5	93.0	7.2	0.00	35	15	-	40.6
1W1	0-19	A1	1.5	.08	12	1.9	7.0	17.4	29.9	15.3	71.5	74.2	24.1	1.7	2	-	5	36.2
**1W2	19-24	B2	2.0	.09	14	2.6	5.5	13.2	32.1	19.1	72.3	76.6	23.1	0.2	5	-	-	37.2
1W3	24-30	IIA1	1.1	.07	10	3.0	13.0	17.3	24.7	12.6	70.5	71.6	26.9	1.5	T	-	-	28.4
*1W4	30-45	IIB2	.3	.02	9	3.2	6.9	17.7	33.6	17.4	78.3	71.6	25.6	2.9	3	-	-	13.2
1W5	45-60	Cm	.2	.03	-	4.5	11.8	15.9	19.8	11.5	63.5	66.7	30.1	3.2	T	-	-	8.8
*3W1	0-15	A1	2.2	.11	13	10.7	16.8	14.3	17.6	11.4	70.8	74.2	25.9	0.0	20	-	-	16.4
3W2	15-35	A1B2	.3	.03	-	12.0	15.3	17.3	24.9	10.6	80.1	81.2	18.7	.1	15	3	-	11.0
3W3	35-50	C1	.3	.03	-	9.3	15.7	17.2	19.2	10.0	71.4	73.9	22.4	3.7	15	5	-	12.3
4W1	0-12	A1	4.5	.22	13	10.2	17.5	16.4	18.6	10.4	73.1	73.1	27.6	0.00	5	-	-	30.2
4W2	12-30	B2	.3	.03	-	13.8	16.5	19.8	20.7	9.3	80.2	84.2	15.2	.06	12	-	-	6.3

*Chert Flake
**None

LITERATURE CITED

Eidt, R.C. 1977. Detection and Examination of Anthrosols by Phosphate Analysis. Science 197:1327-1333.

Morrison, R.B. 1967. Principles of Quaternary Soil Stratigraphy. IN Morrison and Wright (ed.0 Quaternary Soils. INQUA, 1965. vol. 9 Desert Res. Inst. Univ. Nev. Reno).

Reineck, H.E. and I.B. Singh. 1975. Depositional Sedimentary Environments. Springer-Verlag. N.Y. 439 p.

Richmound, G.M. 1965. Glaciation in the Rocky Mountains. (IN Wright and Frey Led.) Quaternary of the United States p. 217-230.

Ruhe, R.V. 1969. Application of Pedology to Quaternary Research. IN S. Pawluke (ed.) Pedology and Quaternary Research. Univ. Alberta. Edmonton

Soil Survey Staff. 1972. Laboratory Methods and Procedures for Collecting Soil Samples. Soil Survey Investigations Rept. 1. U.S. Govt. Printing Office, Washington, D.C.

Soil Survey Staff. 1975. Soil Taxonomy. Agr. Handbook 436. U.S. Govt. Printing Office, Washington, D.C.

APPENDIX C-I

Field Soil Profile Descriptions

Pedon IN (18 N, 30 E)

0-14 cm	A1	mixed recent fill
14-23 cm	B2	
23-33 cm	C	
33-38 cm	IIA1	paleosol
38-48 cm	IIB2	
48-67 cm	IIC1m	mottled
67+ cm	IIIC2	Pinedale glacial till

Pedon 1S (14N, 30E)

0-18 cm	A1	original (little disturbance)
18-25 cm	B2	
25-29 cm	IIA1	paleosol
29-44 cm	IIC1m	mottled
44+ cm	IIIC2	Pinedale till

Pedon 2N (22N, 30E)

0-17 cm	A1	undisturbed
17-30 cm	B2	
30-38 cm	IIA1	paleosol
38-53 cm	IIC1m	mottled
53+ cm	IIIC2	Pinedale glacial till

Pedon 2S (10N, 30E)

0-10 cm	A1	(eroded)
10-20 cm	B2	
20+ cm	IIA1	excavation of Paleosol-intact flakes

Pedon 3N (26N, 30E)

0-16 cm	A1	
16-31 cm	B2	
31-36 cm	IIA1	paleosol
36-49 cm	IIB2	
49-61 cm	IIC1m	mottled
61+ cm	IIIC2	Pinedale till

Pedon IE (16N, 32E)

0-24 cm	A1	mixed recent fill
24-38 cm	IIA1	truncated paleosol
38-48 cm	IIB2	
48-64 cm	IIC1m	mottled
64+ cm	IIIC2	Pinedale till

Appendix C-I continued.

Pedon 5N (34N, 30E)

0-15 cm	A1	
15-32 cm	B2	gravel layer @ 15 cm
32-36 cm	IIA1	silty paleosol
36-40 cm	IIA2	light colored (ashey?)
40+ cm	IIIC1	till

Pedon 3E (16N, 40E)

0-8 cm	A1	undisturbed
8-26 cm	B2	
26+ cm	IIC1	stratified glacial

Pedon 5E (16N, 48E)

0-11 cm	A1	glacial till
11-25 cm	B2	" "
25-35 cm	C1	" "
35+ cm	IIC2	stratified outwash

Pedon 1W (16N, 28E)

0-19 cm	A1	mixed recent fill
19-24 cm	B2	
24-30 cm	IIA1	paleosol
30-45 cm	IIB2	
45-60 cm	IIC1m	mottled
60+ cm	IIIC2	Pinedale till

Pedon 2E (16N, 36E)

0-25 cm	A1	mixed recent fill
25-29 cm	B2	
29-40 cm	IIA1	paleosol
40-50 cm	IIB2	
50-82 cm	IIC1m	mottled
82+ cm		Pinedale till

Pedon 2W (16N, 24E)

0-16 cm	A1	mixed recent fill
16-20 cm	B2	
20-25 cm	IIA1	paleosol
25-38 cm	IIB2	
38-60 cm	IIC1m	mottled
60+ cm		Pinedale glacial till

Pedon 3W (16N, 20E)

0-15 cm	A1	mixed recent till
15-35 cm	B2	colluvial gravel
35-50 cm	C1m	mottled
50+ cm		Pinedale till

Pedon 4W (16N, 16E)

0-12 cm	A1	mixed recent fill
12-30 cm	B2	colluvial gravels
30+ cm	C1	Pinedale till

APPENDIX D

DEBITAGE DISTRIBUTION BY SIZE

APPENDIX D

DEBITAGE DISTRIBUTION BY SIZE (78-79 EXCAVATIONS)

					Flake Length (cm)				
Area	Location	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7
A	12-14S, 2-4E	7	2						
	14-16S, 2-4E	95	91	31	4				2
	14-16S, 4-6E	3	4		1				
	16-18S, 0-2W	1	1						
	16-18S, 0-2E	1	9	1	1	1			
	16-18S, 2-4E	14	18	8					
	18-20S, 2-4E	1	3	1					
B	0-2N, 12-14E		7						
	0-2N, 13-14E	1	4						
	2-4N, 13-14E	11	14						
	4-6N, 13-14E	25	16	1	1				
	4-6N, 14-15E	4	4	1					
	6-8N, 13-14E	3	3						
	8-10N, 13-14E	11	9	2					
C	2-4N, 21-22E	1	8	2					
	4-6N, 21-22E	7	7	4					
	6-8N, 21-22E	6	12	2					
	8-10N, 21-22E	15	17	7	1				
	10-12N, 21-22E	3	5						
	10-12N, 22-23E	4	2						
	10-12N, 23-25E	3	3	1	1				
	12-14N, 21-23E	18	16	2					
	12-14N, 23-25E	9	23	8					
	14-16N, 21-23E	13	6	2					
	14-16N, 23-25E	46	53	6	1	1			
	16-18N, 21-23E		4	2					
	16-18N, 23-24E	4	4						
D	16-18N, 32-34E	6	9		1	1			
	16-18N, 34-36E	3	4						
	17-18N, 36-37E	4	3	2		1			
	17-19N, 37-39E	73	55	23	6	1	1		
	19-21N, 37-39E	1	11	7					
	19-21N, 39-41E	6	15	9	5				
	21-23N, 37-39E	1	4	1					
	21-23N, 39-41E		4	1					
E	12-14N, 39-41E	17	7						

(Continued)

Area	Location	0-1	1-2	2-3	Flake Length (cm) 3-4	4-5	5-6	6-7	7
F	8N, 30E			1					
	10N, 24E	39	3						
	10N, 30E	238	11	1	1				
	10N, 32E	19	7	4					1
	12N, 26E	50							
	12N, 28E	26	5						
	12N, 30E	177	16	6	4	2			
	12N, 32E					1			
	12N, 34E	51	5		2				
	12N, 36E	3							
	14N, 28E	88	3	1	1				
	14N, 30E	17	3	1					
	14N, 32E	116	18	2					
	16N, 28E	97	3	1					
	16N, 30E	206	12	6	4	1			
	16N, 32E	1	1	1					
	18N, 30E	1	2						
	22N, 30E		3						
X	6-8N, 18E	10	12	4					
	12N, 18E	1	1						
	12N, 22E	47							
	14N, 18E	20	2						
	14N, 20E	12		2					
	14N, 22E	78	1						
	14N, 24E	4							
	16N, 18E			1					
	20N, 18E	4	1						
	20N, 36E	3	11	1		1			
	22N, 22-23E								1
	28N, 28E	38	1	1					
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